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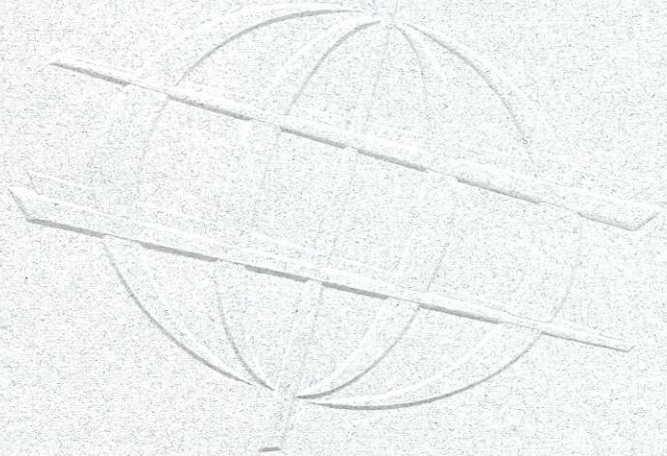

Enhancing Security through a Cooperative Border Monitoring Experiment: a Proposal for India and Pakistan

Major General Mahmud Ali Durrani (Retd)
Rawalpindi, Pakistan

Cooperative Monitoring Center

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Enhancing Security through a Cooperative Border Monitoring Experiment: A Proposal for India and Pakistan

Abstract

South Asia is a recognized nuclear flash point, where India and Pakistan have a history of antagonism and habitual mistrust. For understandable reasons, the mistrust is the deepest amongst the armed forces of the two neighbors. This paper proposes a detailed cooperative border monitoring experiment, the implementation of which could help to reduce the high level of mistrust between the armed forces of India and Pakistan. If implemented, the proposal could also demonstrate systems and procedures to defuse border tensions and contain minor incidents on the border, which in the past have spun out of control.

The essence of the proposal is a cooperative border monitoring experiment at three pre-selected sites. Two sites are on the Indo-Pak international border, requiring cooperative monitoring by the border security forces of both countries, while the third site is on the Line of Control (LOC) in Kashmir, requiring cooperative monitoring between the Indian and Pakistani armies. The proposed cooperative border monitoring experiment uses appropriate technologies and global experience, with the ultimate goal of moving from a relationship of confrontation to a relationship of cooperation. The proposal draws strength from successful contemporary models of cooperative monitoring around the world but has been tailored to the existing environment along the Indo-Pak border and the LOC through detailed discussions with the stakeholders in India and Pakistan.

Acknowledgements

The idea for this study developed during my visit to Albuquerque, New Mexico, to participate in a Balusa Group Meeting sponsored by the Cooperative Monitoring Center (CMC), in March 1999, at the heels of the signing of the Lahore Declaration by the Indian Prime Minister and the then-Pakistani Prime Minister. Much has happened in South Asia since then: the Kargil conflict, the burial of the spirit of Lahore, the military takeover in Pakistan,and heightened tensions in Kashmir. As this study is on the verge of publication, events have taken a full turn; there is again a ray of hope on the horizon, with the forthcoming talks between the Indian Prime Minister and the Pakistani Chief Executive.

My first acknowledgement is to the Cooperative Monitoring Center, which, as an institution, encouraged and supported me while giving me total flexibility in the design and conduct of the experiment. My special thanks go to Mr. Kent Biringer, who was the manifestation of the CMC support; his guidance and enthusiastic help were pivotal for moving the study on a fast track. Without the support of Tom Budge at the University of New Mexico, I could not have obtained all the maps that I needed. Steve Garcia helped me remake the maps to fit the design of the study. I thank Tim Crawford and Alan Runyan-Beebe at the CMC for their support in trying to educate me on the various technologies. I also thank Sally Laundre-Woerner for her help with the diagrams and slides. Mike Vannoni deserves special thanks for the very intense review and polishing of my draft in its final stages. Diane Ross also needs thanks for proofreading my draft and Americanizing the language. Logistically I would have been in the wilderness of New Mexico without the valuable support of Patricia Dickens, Nora Tankersley, and Stephanie Sustaita. I also thank those at CMC who have not been mentioned but helped me in many ways.

Moving home, my gratitude goes to the Pakistan Army for its support and confidence in what I do to improve the Indo-Pak relationship. My special thanks go to General Ehsan-ul-Haq and his staff at General Headquarters (GHQ.) Ehsan has now left for happier hunting grounds. My gratitude also extends to the local commanders at the sites I visited. Without the support of GHQ I could not have done justice to this study. Moving across the border, I would like to thank Salman Haidar for his support in making it possible for me to meet with a variety of serving and retired officials in India. I thank the numerous officials and retired people I met with and discussed the project with in India. Last, but not least, I would like to thank Ambassador Shirin Tahir-Kheli at Johns Hopkins University for her encouragement, guidance, and support.

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Acronyms

AC	alternating current
AAU	Acoustic Add-on Unit
BP	border pillar
BSF	Border Security Force
CBM	confidence building measure
CFE Treaty	Conventional Armed Forces in Europe Treaty
CFL	Cease-Fire Line
cm	centimeter
CMC	Cooperative Monitoring Center
DC	direct current
DIRID	directional infrared intrusion detector
DOE	Department of Energy
GSR	Ground Surveillance Radar
kg	kilogram
km	kilometer
LOC	Line of Control
INF Treaty	Intermediate-range Nuclear Forces Treaty
m	meter
MAGID	Magnetic Intrusion Detection
MINISID	Miniature Seismic Intrusion Detector
NATO	North Atlantic Treaty Organization
PNET	Peaceful Nuclear Explosions Treaty
RF	radio frequency
SFM	Sinai Field Mission
SSCS	strain-sensitive cable sensor
TTBT	Threshold Test Ban Treaty
UHF	ultra-high frequency
UN	United Nations
UNCIP	UN Commission for India and Pakistan
UNMOGIP	United Nations Military Observer Group in India and Pakistan
VHF	very high frequency

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Executive Summary

To the misfortune of the people of India and Pakistan, the two countries have had a relationship of conflict from the time of their creation in August 1947. Over the last fifty years, India and Pakistan have fought three major wars and came very close to an all-out war in June 1999 as a result of the Kargil conflict in the troubled region of Kashmir. Half a century of a cold war and recurring conflict has added to the very high level of mistrust. Although the mistrust is widespread throughout the population of the two countries, the level of mistrust is the highest amongst the military and the security agencies. The very high level of mistrust between the armed forces of the two countries, coupled with the existence of some serious geopolitical disputes like Kashmir and Siachen, make South Asia a nuclear flash point, with grave consequences for the region and the world.

This study recommends a bold and interactive border monitoring experiment at selected sites along the international border and the Line of Control (LOC) based on the prevailing politico-military ambiance in India and Pakistan, the dictates of geography and the wealth of relevant information (historic and technological) at the Cooperative Monitoring Center (CMC) of Sandia National Laboratories. The underlying purpose of the study is to develop a comfort level between the uniformed personnel of India and Pakistan, with the ultimate goal of moving from a relationship of confrontation to a relationship of cooperation. The four objectives of this experiment are as follows:

- ***Human Dimension***—Create opportunities for interaction between uniformed personnel of India and Pakistan and reduce the level of mistrust.

- ***Tension Reduction***—Develop a cooperative environment and pre-empt possible actions that may create tension and conflict along the border.

- ***Confidence Building***—Build confidence between the leadership and uniformed personnel of India and Pakistan through the successful resolution of day-to-day problems along the border.

- ***Collaboration***—Initiate collaboration in a controlled and limited experiment with a view to setting precedents for greater collaboration between the security forces of both nations.

The study evaluates the geography of the border between the two countries to determine the best sites for the border monitoring experiment, in accordance with practical criteria for site selection. The study selected two sites along the Indo-Pak international border and one site along the LOC. The three sites offer an opportunity to conduct the border monitoring experiment in three different types of terrain: semi-desert, heavily cultivated, and mountainous. The selected sites also afford an opportunity to conduct cooperative monitoring between the paramilitary border security forces of the two countries as well as between the regular armed forces deployed along the LOC. This study provides a fairly detailed perspective on the present system of management of the Indo-Pak international border as well as that of the LOC, outlining the day-to-day problems that the security forces confront and how they manage them.

Key features of the study are visits by the author to the three sites (from the Pakistan side), discussions with junior and mid-level officers actually manning the border, and interviews with serving and retired policy level officials in New Delhi and Islamabad/Rawalpindi. The prevailing political environment during the period of the interviews (January to March 2001) was not considered an opportune moment to actually conduct the experiment, given the low level of official contact at that time. However, it was the opinion of the majority of interviewees that with an improved political climate, the study would be very useful. As this study is being published, the opportune moment seems to be on the horizon, with the forthcoming visit of Chief Executive General Pervez Musharraf to India at the invitation of the Prime Minister of India.

The border monitoring experiment has been designed to build upon existing systems and procedures. With the active assistance of the CMC, the author has been able to match the appropriate technologies with the objectives of the experiment. Through the use of unattended ground sensors, thermal imagers, ground surveillance radar, etc., the experiment is designed for the joint obtaining and sharing of information through a transparent and verifiable technical process to enhance the security of both India and Pakistan and reduce the level of mutual mistrust.

Each of the three sites has a different monitoring plan based on the specific requirements of the individual site. At each site, sensors would be deployed jointly along the border, with the data being shared by control centers in both countries. The control centers would be connected through a hot line, allowing interaction on a daily basis between the Indian and Pakistani officials. If the political leadership of India and Pakistan accept the proposal of this study, a detailed technical survey of each site would be required in collaboration with the security forces on both sides of the border.

The nuclearization of India and Pakistan has raised the cost of conflict to unaffordable levels. Without verifiable reassurance, a minor border incident could result in overreaction, a corresponding retaliation, and a broad conflict. The cooperative border experiment, if implemented, could play an important role in developing a higher degree of trust between the uniformed personnel and demonstrate systems and procedures for conflict avoidance. Long-term peace will arrive in South Asia only if determined efforts are made to lower the level of mistrust and move towards the resolution of the major disputes.

Enhancing Security Through a Cooperative Border Monitoring Experiment: A Proposal for India and Pakistan

1. Background

To the misfortune of their people, India and Pakistan have had a relationship of conflict from the very creation of the two countries in 1947. The holocaust at the time of the partition of British India reinforced the existing undercurrent of mistrust[1] between the Hindu and Muslim communities of the subcontinent, especially amongst the migrating masses who in the millions crossed into the country of their choice. The hasty manner in which the British rulers concluded partition added multiple problems for the newly created states of India and Pakistan. Some of the serious territorial disputes that exist between the two nations, including that of Kashmir, are legacies of that haste.

Since partition, India and Pakistan have fought three major wars. In the last week of October 1947, while Indian forces flew into Srinagar (the capital of the princely State of Jammu and Kashmir), tribesmen and volunteers from the Pakistan Army marched into Kashmir. The undeclared war in Kashmir finally ended when a cease-fire was effected through the United Nations (UN). In 1965, both countries fought a full-scale but inconclusive war, once again over Kashmir. This war also ended after a UN call for a cease-fire. In 1971, they fought their third war in which Pakistan lost its eastern half, now Bangladesh. Half a century of a cold war and recurring conflict has added to the high level of mistrust and mutual suspicion. It is the author's opinion that South Asia will see peace once the two major issues—the reduction of mistrust and the resolution of the territorial disputes, particularly Kashmir—are addressed by the political leadership of these two nations. (See Figure 1.)

Although the mistrust between the two nations is widespread throughout the population, the level of mistrust is the highest amongst the security agencies, the military, and, to a degree, in the bureaucracy of both countries. It is therefore vital that the apprehensions and paranoia of the security forces and military high commands are addressed and they are made stakeholders in the peace process. This is particularly true in Pakistan where the military has played a major role in Pakistan's national policy formulation, especially as it related to the development of its relation

[1] Mistrust between the Hindu majority and the largest minority (the Muslims) can be traced back to the advent of the Muslims in the region over a thousand years ago. However, the Mughal rule in the 16th century provided a sense of cohesiveness between the two communities that had not existed before. It established that, with understanding, the two communities could coexist peacefully. Unfortunately, the cleavage between the two communities increased during the rule of the British. It is difficult to determine if it was by default or design. Some South Asian historians point out that the British policy of "divide and rule" was responsible for this mistrust. The granting of separate electorates to the Muslims, in the Act of 1909, formalized the divide.

The Congress Party and the Muslim League strove to maintain a semblance of national unity and Hindu Muslim amity during the movement for Indian independence. But the struggle for political power, as the government became more and more representative, was increasingly on communal lines. Perceiving that in a united India, Muslims would forever remain in a disadvantaged minority position, the Muslim League called for the creation of separate states. Concurrent with the political awakening was religious revival, with radical Hindu and Muslim religious leaders and groups fanning communal hate and mistrust.

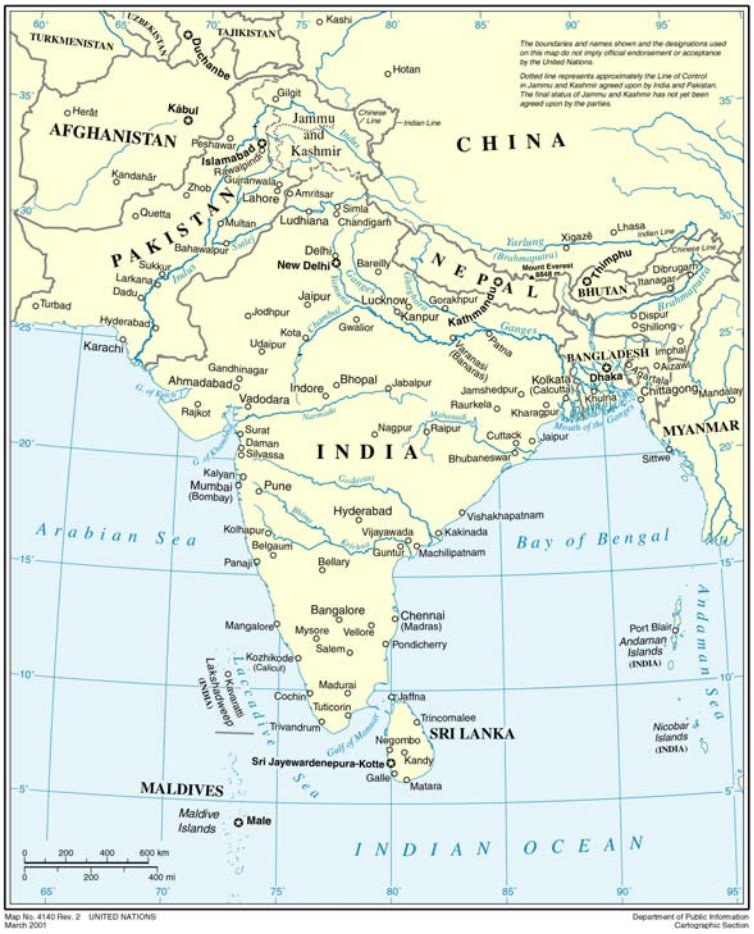

Figure 1. South Asia

Photo used courtesy of the UN Cartographic Section

ship with India. This study is one small attempt to reduce the high level of mistrust between the military institutions of India and Pakistan.

Since the early 1980s, if not earlier, it was universally accepted that both India and Pakistan were nuclear military powers. This belief also existed in the military establishments of both countries. This nuclear ambivalence kept the two neighbors from fighting another all-out war after 1971 in spite of numerous border skirmishes, political saber rattling, and the continuing high levels of mistrust. The May 1998 nuclear tests by India and Pakistan have led many South Asia watchers to believe that the nuclearization of South Asia would usher in a greater measure of stability. This was based on the belief that both the countries would not risk a confrontation that could spin out of control to the nuclear level. However, post-May 1998 events have proved otherwise. The Kargil conflict of May 1999 came on the heels of the nuclear tests of May 1998 and the Lahore summit of February 1999. The nuclearization of India and Pakistan did not in the past and will not in the future prevent them from blundering into yet another war.

In the last week of April and the first week of May 1999, while the author of this study was on a personal peace mission to New Delhi, Indian commanders in Kashmir were surprised to discover the presence of armed personnel firmly entrenched on the heights north of Kargil. It took a few days before the extent of the hostile presence was fully realized by the high command in New Delhi. India described the hostile presence as Pakistan-trained Islamic militants and regular Pakistan troops who were intruding. Pakistan denied any involvement, contending that Kashmiri freedom fighters were holding the Kargil heights and fighting for the liberation of their homeland. The Indians mounted a major offensive to evict the "intruders." The Kargil drama[2] finally came to an end in July 1999, in the wake of the Sharif/Clinton meeting of July 4, 1999, in Washington, D.C. The Kargil conflict and the subsequent takeover of the government by the

[2] The Kargil conflict (though limited to the Kargil sector) had all the trappings of a major war, i.e., large-scale troop engagements including hand-to-hand combat, heavy artillery dueling, use of air power, and heavy human casualties on both sides. De-escalation finally occurred after the Washington declaration, in the form of a joint statement by President Clinton and Pakistan's Prime Minister Nawaz Sharif, on July 4, 1999.

military in Pakistan has brought Indo-Pakistan relations to the lowest ebb since 1971 and increased the level of mistrust between the two nations.

Just a few months before Kargil, in a seemingly visionary step, the prime ministers of both nations took a bold and comprehensive initiative to develop a relationship of peace and cooperation. The two prime ministers signed the famous Lahore Declaration in February 1999 (see Appendix A). Besides addressing the issue of mistrust and committing to resolve all issues, including territorial ones, the declaration recognized the nuclear dimension of the security relationship, its attendant risks, and the need to avoid conflict. Why then did the nuclear deterrence and the Lahore initiative fail to prevent Kargil? It is unfortunate that the major stakeholders in the bilateral security relationship, especially in Pakistan, were not on board nor was adequate preparation made by the staff for the summit. Therein lay the seeds of the collapse of the Lahore Declaration. The Kargil conflict (May 1999) delivered a crippling blow to a far-reaching political agreement.

As mentioned earlier, long-term peace will arrive in South Asia only if determined efforts are made to lower the level of mistrust and move toward the resolution of the major disputes between the two nations. Over the last fifty years, a number of confidence building measures (CBMs) have been recommended, and some implemented, in the interest of developing a peaceful and cooperative relationship between India and Pakistan. These CBMs have been in the areas of security, political, economic, and social issues. **This study recommends a bold, dynamic, and interactive border monitoring initiative to reduce the high level of mistrust between the uniformed communities of India and Pakistan.**

Before the concept and objectives of this study are discussed, it would be useful to outline a few precedents of cooperative monitoring in the contemporary world. One of the most intrusive and successful joint monitoring models was the Intermediate-range Nuclear Forces (INF) Treaty of 1987 between the U.S. and the Soviet Union at the height of the Cold War. Another successful example of cooperative monitoring took place in the Sinai Peninsula on the heels of the Yom Kippur War of 1973. These two examples of cooperative monitoring and a few others will be discussed in some detail in the next section of this study.

The author of this paper is motivated by a desire to contribute to the development of a cooperative and tension-free relationship between his country and India. He is aware that the Soviet-U.S. model or any other model cannot be applied to the security environment of South Asia. But he is equally convinced that contemporary models can provide guidance in the form of ideas and concepts for the development of a "desi"[3] cooperative model, tailored specifically for India and Pakistan.

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[3] *Desi* is a common word in Hindi and Urdu that means local, indigenous. It is derived from the word "dais", which means homeland.

2. Contemporary Models of Cooperative Monitoring

The key to the concept of cooperative monitoring has been to develop a level of trust and achieve mutual reassurance through verifiable means. In the absence of verifiable reassurance, the perception of an imminent threat can invite a prompt response and, in such an environment, overreaction to a perceived minor incident can result in retaliation and possible conflict. During the Cold War, numerous tense situations between the two power blocks could have spun out of control and resulted in a disastrous nuclear holocaust. The first step toward the commencement of World War I could be traced to the lack of a mutually verifiable reassurance system. With constant political and military tensions between India and Pakistan, many times both nations have lurched towards a full-scale conflict. In 1986, as a reaction to Indian military maneuvers, the Pakistani military, fearing an Indian preemptive strike, mobilized its forces. Only a last-minute de-escalation prevented a serious conflict.

Contemporary times have seen a number of cooperative monitoring initiatives implemented throughout the world to reduce military tensions and disengage forces. CBMs have been used to reduce overall tensions and prevent conflict. Some initiatives have been bilateral while others have had the support of a third country or the United Nations. While there are a number of cooperative monitoring models, there is no example of bilateral cooperative border monitoring. Some of the contemporary cooperative monitoring models are outlined below.

2.1. Intermediate-Range Nuclear Forces (INF) Treaty

On December 8, 1987, U.S. President Ronald Reagan and Soviet Secretary General Mikhail Gorbachev, at the height of the Cold War, signed the "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of their Intermediate-Range-Nuclear Forces." The INF Treaty enjoined the two countries to eliminate all ground-launched missiles with ranges from 500 to 5,500 kilometers (km). This required the elimination of about 2,700 missiles. The treaty envisioned cooperative monitoring by teams of inspectors from the Soviet Union and the U.S., with the objective of the elimination of all weapons under the provision of this treaty. It was a very intrusive treaty where inspectors not only monitored storage facilities but also monitored operational, support, and production facilities.

This treaty specified several types of on-site inspections. Inspections were developed to establish an inventory baseline, to monitor the elimination of 2,692 INF missiles, to provide short-notice inspections of active operational bases, and to provide perimeter (including all entry and exit points) monitoring for 24 hours, 365 days a year of a designated missile production/ assembly facility in each country. American inspectors monitored the portals and perimeter of the Votkinsk Machine Building Plant in the Udmurt Autonomous Soviet Republic while Soviet inspectors monitored the Hercules Plant No. 1 in Magna, Utah.

A series of U.S.–Soviet "technical talks" were held to discuss the implementation of the on-site inspection provisions of the treaty. Detailed procedures were developed to define inspection mechanisms, including rules for the actual conduct of the inspection, the role of the escorts (who were acting less as watchdogs and more as facilitators), preparation and signing of the inspection report by the leader of the inspection team and the head of the facility inspected, etc. These talks also resolved other practical issues such as transport arrangements and

responsibility for travel within host country, the system of communication, visa status, and accommodation of temporary and resident inspectors.

The INF Treaty, signed by the principal adversaries of the Cold War, was highly intrusive and mistrust ran high. However, because of political will, detailed preliminary groundwork, and the determined spirit to break away from the past, the implementation of the INF treaty became an excellent example of cooperative monitoring by trained personnel through technical means.

The INF Treaty was a forerunner to continued cooperation between the U.S. and the Soviet Union. On June 1, 1990, President Bush and President Gorbachev signed new protocols to the Threshold Test Ban Treaty (TTBT) and the Peaceful Nuclear Explosions Treaty (PNET). These treaties (first signed in 1974 and 1976) limited the size of underground nuclear explosions to 150 kilotons or less. The new protocol authorized reciprocal verification rights, including monitoring the nuclear tests through on-site inspections. On November 19, 1990, the multilateral Conventional Armed Forces in Europe (CFE) Treaty was signed in Paris. The experience of monitoring the INF Treaty helped the development of monitoring techniques and procedures for the newer protocols, which were also fairly intrusive.

2.2. Hungary-Romania "Open Skies" Regime (1991)

In May 1989, the U.S. proposed a multilateral Open Skies regime between North Atlantic Treaty Organization (NATO) countries and Warsaw Pact countries to increase transparency of military activities. However, despite wide interest, negotiations bogged down because of the intrusiveness of the proposal. Concerned about the potential collapse of the Warsaw Pact and the stalemate in the multilateral proposal, Romania proposed negotiations for a bilateral Open Skies agreement in the fall of 1990. Hungary agreed to talk with Romania in January 1991.

Bilateral negotiations began in February 1991 and quickly produced results. The main body of the agreement was negotiated in three days, based on the most recent text from the multilateral talks. Each delegation contained military and technical specialists and was led by officials who had participated in the multilateral Open Skies conferences. Eight detailed annexes to the main agreement were produced by March, and the agreement was signed in Bucharest on May 11, 1991.

The primary goal of the Open Skies agreement was to increase transparency and to reduce tensions regarding military matters. The agreement did not place any limitations on military or other activity. Encouraged by the bilateral agreement between Hungary and Romania, the multilateral Open Skies negotiations reconvened in September 1991 and significant progress was made in narrowing differences. The multilateral treaty was finally signed in Helsinki on March 24, 1992.

Some highlights of the Hungarian-Romanian bilateral Open Skies regime include:

- The primary goal of the agreement was to increase transparency and to reduce tensions regarding military matters.
- The reconnaissance aircraft of one country could fly over the airspace of the other country without restrictions except those required by safety.

- An escort from the observed country traveled in the aircraft of the observing country.
- Both countries were allowed to use twin-engine turbo-prop aircraft (AN-24 and AN-30).
- Sensors were limited to optical and video cameras; however, provisions were made to accommodate new types of sensors.
- Preflight inspection of the aircraft by the observed country was allowed.
- The quota of the flights for each country was four per year.
- The distance and duration of flights was limited to 1,200 km or three hours, whichever came first.
- Technicians at a designated facility in the host country developed two sets of films jointly.

The bilateral Open Skies regime between Hungary and Romania continues to operate, even after the signing of the multilateral Open Skies treaty.

The Hungarian-Romanian experience shows that Open Skies is a truly cooperative endeavor, requiring a high degree of coordination and real teamwork by officials of both countries. This experience also reaffirms the usefulness of Open Skies as an effective confidence building measure, especially when the monitoring aircraft has unrestricted access and can fly over military facilities.

2.3. U.S.-Mexico Border Monitoring System

From a military perspective, the U.S.-Mexico border is one of the most peaceful borders in the world, but it is one of the most active borders in terms of monitoring activity. The primary issue along the 2,000 miles of this border is the high rate of crossing of illegal immigrants and the flow of drugs from Mexico to the U.S. The U.S. Border Patrol (part of the U.S. Department of Justice) is supported by sophisticated technology, aircraft, and a host of other means. In 1999, Border Patrol agents apprehended more than 1.5 million persons for illegal entry in the U.S. and seized more than $1.9 billion in narcotics.[4]

Although there is a fairly high degree of cooperation between the border monitoring forces of the U.S. and Mexico, there is no serious joint monitoring. This border does not provide any example of cooperative monitoring but does provide ideas for cooperative border monitoring, especially in the effective use of contemporary technologies for monitoring. The author of this study visited the U.S. Border Patrol, El Paso (Texas) Sector, to familiarize himself with the various in-use technologies and techniques for border monitoring.

The total length of the U.S.-Mexican border is marked by pillars and physically overseen with the help of patrol stations, permanent traffic checkpoints at crossing places, vehicle and horse patrols, observation posts, and aerial surveillance, which is not unlike the Indo-Pak border.

[4] Information gleaned from a presentation made at the headquarters of the El Paso Sector of the U.S. Border Patrol on October 3, 2000.

The U.S. Border Patrol effects its mission using a variety of equipment and technologies such as tower-mounted halogen lights, remote day and night video surveillance cameras, unattended ground sensors, and special border fencing at key locations. Data collected and transmitted by the monitoring system is stored and analyzed with the aid of computer systems.

Some of the technologies used by the U.S. Border Patrol that could be applied in the Indo-Pakistan environment are halogen lights, remotely controlled long-range zoom day and night surveillance cameras, special fencing, unattended ground sensors, and computer-based data banks. Incidentally, the security agencies and the armed forces of India and Pakistan are familiar with most of these technologies.

2.4. The Palestinian Authority and Israel—An Environmental Cooperative Monitoring Project

"We all drink the same water; we breathe the same air."
Dalia Itzik, Israeli Environmental Minister (1999)

Though not directly related to security, a Palestinian/Israeli environmental cooperative monitoring project is worthy of mention. Despite the deep mistrust and the high level of hostility between the two entities, this cooperative project is a success, allowing scientists of both parties to interact in a cooperative fashion. Environmental issues can contribute to internal and external security problems.

The CMC supported this project of regional scientific cooperation, which measures parameters affecting sustainable land use. The project has brought together Palestinian, Israeli, and U.S. environmental scientists at Hebron University, the Ministry of Environmental Affairs of the Palestinian Authority, the Mitrani Center for Desert Ecology of Ben-Gurion University, the Volcani Center of the Israeli Ministry of Agriculture, and the University of New Mexico (USA).

The project established joint data collection capabilities at two Israeli and two Palestinian environmental research stations. All the parties involved (Israeli, Palestinian, and American citizens) share the data from these research stations. This project also provides opportunities for scientists to visit each other's research stations and experiment sites and share the data gathered at these sites. The project has met its goal of establishing a meaningful precedent for collaborative projects between Palestinian and Israeli scientists. Project achievements include:

- Facilitated formal agreements between Israeli and Palestinian academic and government institutions to participate in joint projects.
- Completed a joint plan for technical configuration, communication, data sharing, and display.
- Established two meteorological stations in Israel and two in the Palestinian Territories with exchange of data through the Internet beginning in 1999.[5]
- Provided the basis of new regional collaborative proposals for joint international funding.

[5] Project details and data are available at http://www.cmc.sandia.gov/ILTER/.

2.5. Cooperative Monitoring in the Sinai: Israel and Egypt

2.5.1. Context

Israel occupied the Egyptian Sinai peninsula as a result of the June 1967 Arab-Israeli War. In October 1973, an Arab coalition attacked Israel with the intent of regaining occupied territory. The war ended somewhat inconclusively with a formal cease-fire on November 11, 1973, but the situation was unstable. Seeking to avert further hostilities, U.S. Secretary of State Henry Kissinger initiated a process whereby Israel slowly removed its troops from the Sinai, while maintaining Israeli security by assuring sufficient early warning of attack. Both Egypt and Israel thought the presence of the U.S. as a third party was necessary to assist in negotiation and implementation of an agreement.

2.5.2. Agreement to be Monitored

The first Sinai Disengagement Agreement (Sinai I) was signed on January 18, 1974, and required the Israelis to withdraw to approximately 20 km east of the Suez Canal. A 5- to 7-km-wide buffer (demilitarized) zone was established, and limited force zones were created on both sides of the buffer zone. The U.S. and the UN supported the agreement as third parties. The U.S. supported UN peacekeepers with aerial surveillance flights.

The Sinai II Agreement was signed on September 4, 1975. In Sinai II, Israel agreed to withdraw from the strategic Giddi and Mitla passes in west-central Sinai in exchange for third-party monitoring by the U.S. and for the UN to provide tactical early warning.

2.5.3. Role of Monitoring in the Agreement

A *Joint Commission and Liaison System*, incorporating representatives from all parties involved and chaired by the Chief Coordinator of the UN peacekeeping mission, was established to supervise and coordinate implementation of the agreement. The Commission met monthly in the buffer zone (or as requested by the parties) to supervise implementation of the Sinai II agreement, evaluate reports from observers, and resolve problems or violations.

The UN provided 4,000 peacekeeping troops to perform general observation and on-site inspections of garrisons in the limited force zones. The U.S. performed periodic overflights of the disengagement zone and established the Sinai Field Mission (SFM) to monitor access to the Giddi and Mitla passes using a variety of monitoring and communication technologies. Multiple types of sensors, as shown in Table 1, were employed by the SFM to detect activity in the region and to assist observers in identifying the cause of intrusion alarms.

Table 1. Sensors Employed by the Sinai Field Mission

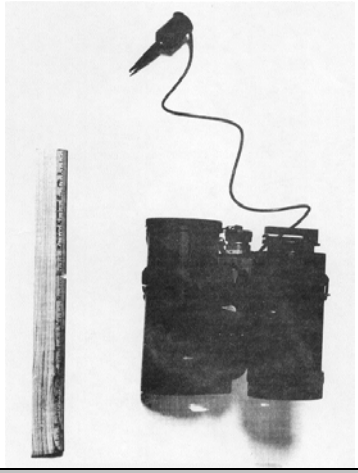
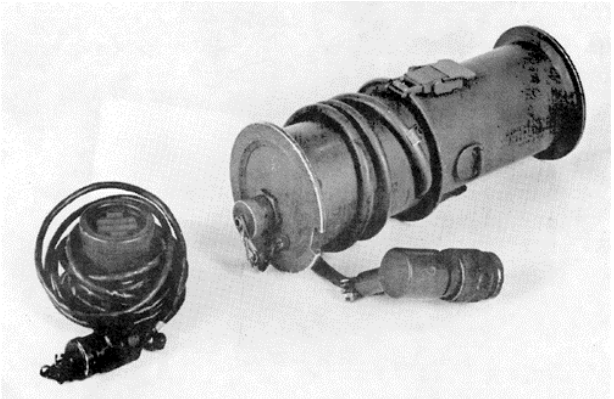
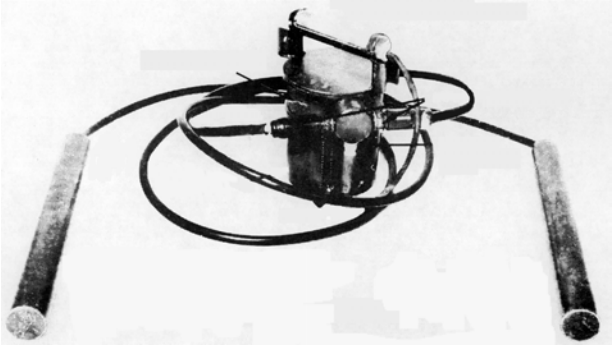
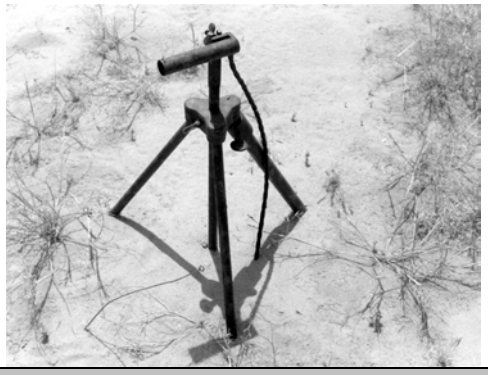
Seismic Sensor	
	*The Miniature Seismic Intrusion Detector (MINISID-III) was the most commonly used sensor because of near-ideal conditions in the desert soil*. The battery-powered MINISID provided three levels of sensitivity. An external geophone was permanently connected to the detector case by a 0.6-m cable. The MINISID detected vehicles at up to 500 m and personnel at up to 50 m (nominal ranges are 300 m and 30 m, respectively). The seismic signal was transmitted to an adjacent watch station by radio. *Dimensions:* 19.0 cm long x 19.0 cm wide x 7.6 cm high; weight: 4.1 kg
Acoustic Sensor	
	*The Acoustic Add-on Unit (AAU) was a modular addition to the MINISID-III and used its power and radio transmission system.* The AAU microphone was attached to the electronics unit by a 3-m cable. Three seismic activations of the MINISID-III within 20 seconds activated the AAU to listen for 15 seconds. It could detect personnel at up to 30 m and vehicles at up to 100 m. *Dimensions:* 25.2 cm long x 7.6 cm diameter; weight: 3.2 kg
Magnetic Sensor	
	*The Magnetic Intrusion Detection (MAGID) system, which was a modular addition to the MINISID-III, detected changes in the earth's magnetic field caused by the motion of ferrous material.* The MAGID could detect a person with a rifle at 3 to 4 m and a medium truck at 15 to 20 m. The unit consisted of two solenoid assemblies interconnected by a 3-m cable. The main module contained the electronic processing and an interface plug for connection to the MINISID, which provided power and a radio link.

Table 1. Sensors Employed by the Sinai Field Mission, continued

Strain Sensor	
	*A strain-sensitive cable sensor (SSCS) was buried under roads and main trails.* The coaxial cable could be up to several hundred meters long. An electronics module was also buried alongside the path. The compression caused by the passage of an object induced a signal proportional to weight. When a crossing occurred, the electronics unit sent a call-up pulse to a MINISID for transmission to a watch station.
Infrared Sensor	
	*The directional infrared intrusion detector (DIRID) was used to monitor roads and large paths.* The DIRID system consisted of a transmitter and receiver for two parallel infrared beams mounted on tripods above ground. DIRID could monitor a space 3 to 17 m wide. Passage of an object through the beam broke the circuit and activated the sensor. The order of beam breakage indicated the direction of movement.
Video Camera	
	A commercial low-light TV camera with high-frequency radio transmission to the base camp was used at the western Giddi sensor field, which was beyond visual line of sight. A remotely controlled spotlight was used to enhance the video camera's night vision capability. Video also was used to monitor the security perimeter of the base camp.

When a sensor was activated, it sent a radio signal to the adjacent watch station, where the event was recorded. If the SFM observers determined an illegal intrusion caused the alarm, a very high frequency (VHF) radio message, backed by teletype, was sent to the base camp, which communicated the record of the intrusion and the SFM analysis of the intrusion to the parties involved in the agreement. Messages were simultaneously transmitted by teletype in English to the Israeli Government (Jerusalem), the UN Chief Coordinator (Jerusalem), the Egyptian Ministry of Defense (Cairo), UN Emergency Force Headquarters (Ismailia), and the U.S.

missions in each country. Reports of violations could reach the parties within 5 minutes. The Joint Commission and Liaison System evaluated the reports.

The system performed quite reliably although periodic refinements were necessary. On average, there were 200 sensor activations a day, almost all of which resulted from permitted activity or natural occurrences. Activations were caused by support vehicles, movement of UN peacekeepers, natural seismic disturbances, low-flying aircraft, wildlife, and nomadic Bedouins. All reported violations were relatively minor, unintended, and easily resolved by the Joint Commission.

2.5.4. Conclusion

After a period of initial suspicion, the Sinai front stabilized and the monitoring activities became almost routine. Political leaders in both countries eventually praised the SFM. The right combination of technical measures and manned operations proved to be vital to the success of the operation. The increased level of confidence resulting from the Sinai monitoring was a major contribution to the Camp David Agreement (March 1979) and Egypt-Israel Peace Accord (October 1979). The system was shut down in January 1980.

3. Concept and Objectives of the India-Pakistan Cooperative Monitoring Initiative

3.1. Concept

The broad goal of this study is to develop practical and innovative concepts for border-monitoring experiments between India and Pakistan. The proposed experiment is possible only if Indian and Pakistani political leadership agree to accept this proposal.

The underlying purpose of the cooperative border monitoring experiment proposed in this study is to develop a comfort level between the uniformed personnel of India and Pakistan, with the ultimate goal of moving from a relationship of confrontation to a relationship of cooperation. In essence, this experiment is a CBM. If successfully implemented, it could be a model and the forerunner for greater collaboration and reduction of tensions along the entire border. The cooperative monitoring concept could also be applied to nonmilitary areas such as floodwater control, meteorological data sharing, ocean pollution, air quality management, and agriculture. The possibilities are endless.

Cooperative monitoring, for the purpose of this study, is defined as "the obtaining and sharing of agreed information among parties to enhance their security." Monitoring technologies can play a useful role and act as a catalyst in the implementation of joint monitoring agreements.

The Cooperative Monitoring Center (CMC) of Sandia National Laboratories is the sponsor of this project, with no strings attached. The CMC assists political and technical experts from around the world to acquire the technology-based tools they need to assess, design, analyze, and implement nonproliferation, arms control, and other cooperative security measures. The CMC provides a forum for international and regional experts to explore ways that technology can facilitate achieving and maintaining a wide range of bilateral, international, and regional security

objectives. The CMC is motivated by the desire for global peace and a willingness to share its expertise with other nations of the world. The CMC supports this project based on the belief that peace and security in South Asia is in the U.S. national interest. Appendix B provides a brief overview of the CMC, including its mission and vision.

3.2. Proposed Project Objectives

The four broad objectives developed for the Cooperative Border Monitoring Experiment between India and Pakistan are:

- ***Human Dimension***—Create opportunities for interaction between uniformed personnel of India and Pakistan and reduce the level of mistrust.
- ***Tension Reduction***—Develop a cooperative environment and preempt possible actions which may create tension along the border.
- ***Confidence Building***—Build confidence between the leadership and uniformed personnel of India and Pakistan through the successful resolution of day-to-day problems along the border.
- ***Collaboration***—Initiate collaboration in a controlled and limited experiment with a view to setting precedence for greater collaboration between the security forces of both nations.

It is the desire of the CMC leadership as well as the author that this project moves beyond the academic framework, with a view to achieving a high probability of implementation. It was therefore decided that the basic groundwork for this study should be done in India and Pakistan, involving past and present military commanders and decision-makers in the development of this experiment. Despite the very poor level of relations between India and Pakistan at the time of this study (post-Kargil May 1999 to May 2001), the author was encouraged and supported by uniformed people in both India and Pakistan. This study has thus been enriched by the views of commanders and officials on both sides of the border.

3.3. Criteria for the Selection for Border Monitoring Experiment Sites

Keeping the objectives of the experiment in mind, the author developed the following criteria for the selection of appropriate sites:

- ***Low Tension Area***—Initiating a cooperative experiment in areas with high tension would be difficult. It was therefore decided to select sites where the level of tension is lower. Overall the level of tension along the Line of Control (LOC)[6]

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[6] In July 1949, India and Pakistan, under the umbrella of the UN Commission for India and Pakistan (UNCIP), signed the Karachi Agreement establishing a cease-fire line in the then-States of Jammu and Kashmir. The cease-fire line as described in the Karachi Agreement was verified mutually and was to be supervised by UN observers. On March 30, 1951, following the termination of UNCIP, the UN Security Council by a resolution (91 of 1951) decided that the United Nations Military Observer Group in India and Pakistan (UNMOGIP) would continue to supervise the

is much higher than that along the international border—the LOC is manned by regular troops while paramilitary border security forces man the international border. However, the author believes that at least one site needs to be selected on the LOC to develop an interactive process between regular army troops of the two countries.

- ***Logistic Supportability***—A cooperative border monitoring experiment will require a certain level of accessibility, the availability of a road or a motorable track, and a ready supply of electricity. The site should be maintainable in winter and summer. Therefore, rugged, glaciated mountains and virgin desert with extreme temperatures would demand a high degree of dedicated support. Areas with a fairly well-developed infrastructure are more suitable for the experiment.

- ***Technical Feasibility***—It is important to ensure that the chosen monitoring sensors are compatible with the environment and terrain in which they are to operate. Extreme temperatures, soil conditions, intervisibility, pattern of trans-border movement, fog, blizzards, sandstorms, etc., may restrict the employment of monitoring devices. Sites selected for monitoring should represent a range of activities that support study objectives.

- ***Economic Affordability***—This criterion relates to the combination of characteristics associated with a site that affect the cost of establishing and operating the experiment. Inaccessible areas, sites without electricity, sites away from communication centers, sites away from repair facilities, sites with heavy weathering effects, areas with a high incidence of thefts, etc., require additional investment and would be difficult to afford.

- ***High possibility for agreement between India and Pakistan on the site***—In view of the high level of mistrust and the sensitivities of both nations, both establishments will perceive the cooperative border monitoring experiment differently, making sure that the selection of a particular site does not provide the other side with any real or perceived advantage. For example, Pakistan would be reluctant to allow large or permanent structures along the LOC as it considers the LOC a temporary line and does not want it to be equated with the international border.

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cease-fire in Kashmir. UNMOGIP's function was to observe and report, investigate complaints of cease-fire violations, and submit its findings to each party and the Secretary General.

In 1971, hostilities once again broke out between India and Pakistan and when finally a cease-fire came into effect, both countries (by an agreement in July 1972) defined the LOC in Kashmir. The LOC, with minor deviations, followed the same course as the cease-fire line established under the Karachi Agreement.

4. India-Pakistan Border Terrain Evaluation and Site Selection

4.1. Categories of Border

Approximately 3,000 kilometers long, India and Pakistan's border traverses the glaciated region and lofty mountains of the Karakoram Mountain Range, meanders southwest through the extensively cultivated and the highly populated plains of the Punjab and Rajasthan, and thence through the waterless expanse of the desert region of Sind. Ultimately, the border dips into the vast mud flats and marshlands of the Rann of Kutch, and finally into the coastal swamps on the Indian Ocean.

The border between India and Pakistan has four distinct categories of border, as follows:

- ***International Border***—This is the border officially recognized since August 1947 by both India and Pakistan as their international border. Starting in the North, it defines the border between the Pakistani and India provinces of Punjab, which in 1947 were carved out of one Punjab. The international border culminates at the disputed Sir Creek in the south. The international border is about 2,200 kilometers long.

- ***Working Boundary***—Starting from the northern edge of the international border, this is the 200 kilometers of border between the old States of Jammu and Kashmir and Pakistan's Punjab. *India now considers this boundary as an international border.*

- ***Line of Control***—Northward from the working boundary, this is the border dividing the former princely state of Kashmir into the Pakistan-controlled and the Indian-controlled portions. Based on the old cease-fire line (CFL) of 1948, it is designated as the LOC as a consequence of the 1971 war and the Simla Agreement. In the south, the LOC touches the working boundary and was delineated in the north up to the now well-known point NJ 9842. The LOC is about 767 kilometers long.

- ***Line of Contact (Holding)***—This is the present line of contact between the deployed Indian and Pakistani troops fighting along the Siachen glacier, which is the general area northwards beyond NJ 9842. The approximate length of the Line of Contact is 95 kilometers.

4.2. Geographic Classification of the Border

For the geographic classification of this study, the term "border" includes the disputed Siachen region, the LOC, the working boundary, and the international border between India and Pakistan. This classification divides the border into broad geographic zones, grouping terrain with distinct geographic and climatic conditions into separate zones. The total border can be divided into the following six distinctive geographic zones; each zone has a high level of homogeneity.

- ***Siachen Zone***—The Siachen Zone coincides with the Line of Contact. Very high altitudes, arctic temperatures, and a total absence of plant or animal life characterize this zone. The perpetually snow-covered rugged mountains rise up to and beyond 25,000 feet above sea level. Winter temperatures can fall below –50° centigrade and the summer temperatures remain below freezing. This is an area of howling blizzards, rugged heights, and rarified air.

  At Siachen, the highest battlefield in the world, casualties are caused more often by the effects of climate and terrain than by enemy action. Humans operating at these heights need to undergo a phased acclimatization program before they are capable of functioning. For the same reason, logistics are a nightmare. Supplying ammunition, stores, and food to the forward combat positions and the evacuation of casualties are either by human porters or special helicopters that can fly in rarified atmosphere but are seriously restricted in the load they can carry.

- ***Northern Zone***—This zone is the northern portion of the LOC, from NJ 9842 south to a point on the LOC due north of Srinagar at Gurez. This zone also approximately coincides with Pakistan's northern area border and Indian Kashmir. This part of the border is also characterized by lofty mountains rising in height from 20,000 feet in the northern portion of the zone to 14,000 feet in the southern portion of the zone. The now-famous Kargil is also in this zone. Limited movement across the LOC is possible and restricted to mountain passes and narrow valleys formed by streams and rivers. This border zone has a very poor communication infrastructure. While the peaks rise above the tree line, the terrain below 14,000 feet is wooded. Most of the area is covered by snow in the winter; temperatures in the summer are mild.

- ***Central Kashmir Zone***—This zone extends from Gurez on the LOC to the southern extremity of the LOC. This section of the border also traverses mountainous terrain, higher at Gurez (12,000 feet) and reduced to low hills (3,000 feet) in the south, as the LOC terminates on the Chenab River. Mountainous and wooded for most of its length, it is highly porous and allows multiple avenues for cross-border movement from either part of Kashmir into the other. In this zone, the LOC runs north to south and in a zigzag fashion, forming numerous terrain salients on either side of the border. This zone has almost all the historical road links between Indian and Pakistani Kashmir, to include the Muzaffarabad–Srinagar road along the Jhelum River valley, the Rawalakot Punch Road, and numerous minor roads and tracks.

- ***Punjab Zone***—This zone starts from the northern edge of what Pakistan calls the Working Boundary (east of the Chenab River) and goes down to Fort Abbas on the international border. The Punjab Zone is generally flat, extensively cultivated, and heavily populated. This area has a network of irrigation channels and a well-developed communication infrastructure. Three of the major tributaries of the Indus River (the Chenab, Ravi, and Sutlaj Rivers) traverse the border in this zone. Major communication and population centers are located on both sides of the border.

Despite a large number of historical crossing sites in this zone, currently this zone has the only active border-crossing site between India and Pakistan. Commonly referred to as the "Wagha Border," this site connects Lahore (Pakistan) with Amritsar (India) through a road and a rail link. The Indian Prime Minister entered Pakistan through this crossing on a bus in February 1999 and signed the Lahore Declaration with his Pakistani counterpart. Today, road and rail movement between India and Pakistan operate only through Wagha.

- ***Desert Zone***—This zone extends from Fort Abbas in the north to the Indus River delta in the South. This zone initially traverses semi-desert terrain and later the deserts of Cholistan and Thar. With sparse population and an underdeveloped infrastructure, there is a broad range of diurnal temperatures. The short winters are mild and the long summers are very hot, with the maximum day temperatures rising up to 120° Fahrenheit. The terrain is typically sandy with both shifting and stable dunes. Water is scarce and frequently the subsoil water is saline and brackish.

- ***Coastal Zone***—The Indo-Pak boundary finally runs through the low-lying, tabletop, salty waste lands called the Rann. A variety of creeks jut out like fingers from the body of the Indian Ocean into the marshy flatlands of the Rann. The alignment of the international border here is also disputed and is commonly referred to as the Sir Creek issue. This area is devoid of resident population.

4.3. Sites Selected for Border Monitoring Experiment

After evaluation of the terrain, the application of the site selection criteria, and the author's personal assessment, three sites were selected: two on the Indo-Pak international border and one on the LOC dividing Kashmir. See the map in Figure 2. The three sites selected are:

1. Wagha-Attari Sector
2. Fort Abbas-Anupgarh Sector
3. Chakothi-Uri Sector

Each site will be described in the following sections.

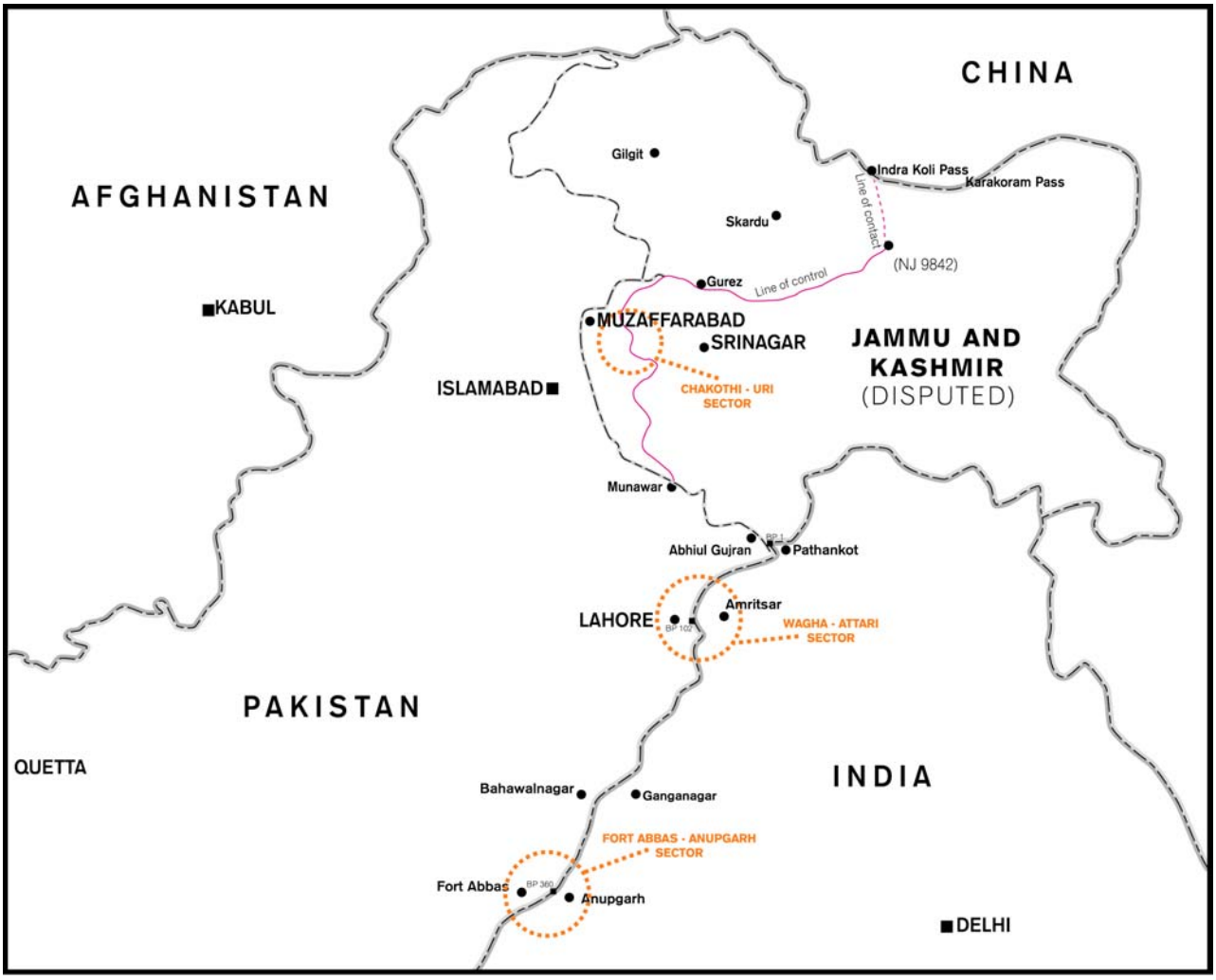

Figure 2. Sites Selected for Cooperative Monitoring Experiment

1. Wagha-Attari Sector (Figure 3). This sector of the international border has a railway and a blacktop road that connect Lahore (Pakistan) with Amritsar (India). This is the only official active land-route crossing between the two countries. This area is well populated on both sides of the border and has a fairly high incidence of smuggling. A low level of cooperative border crossing monitoring already exists at this site.

Figure 3. The Wagha-Attari Sector

2. Fort Abbas-Anupgarh Sector (Figure 4). In this sector of the international border the cultivated area (green belt) changes to arid semi-desert terrain. The infrastructure here is less developed and the population density lower as compared to the Wagha-Attari section. This area is a relatively quiet section of the border where the issues are limited to stray cattle, occasional smugglers, and inadvertent crossers.

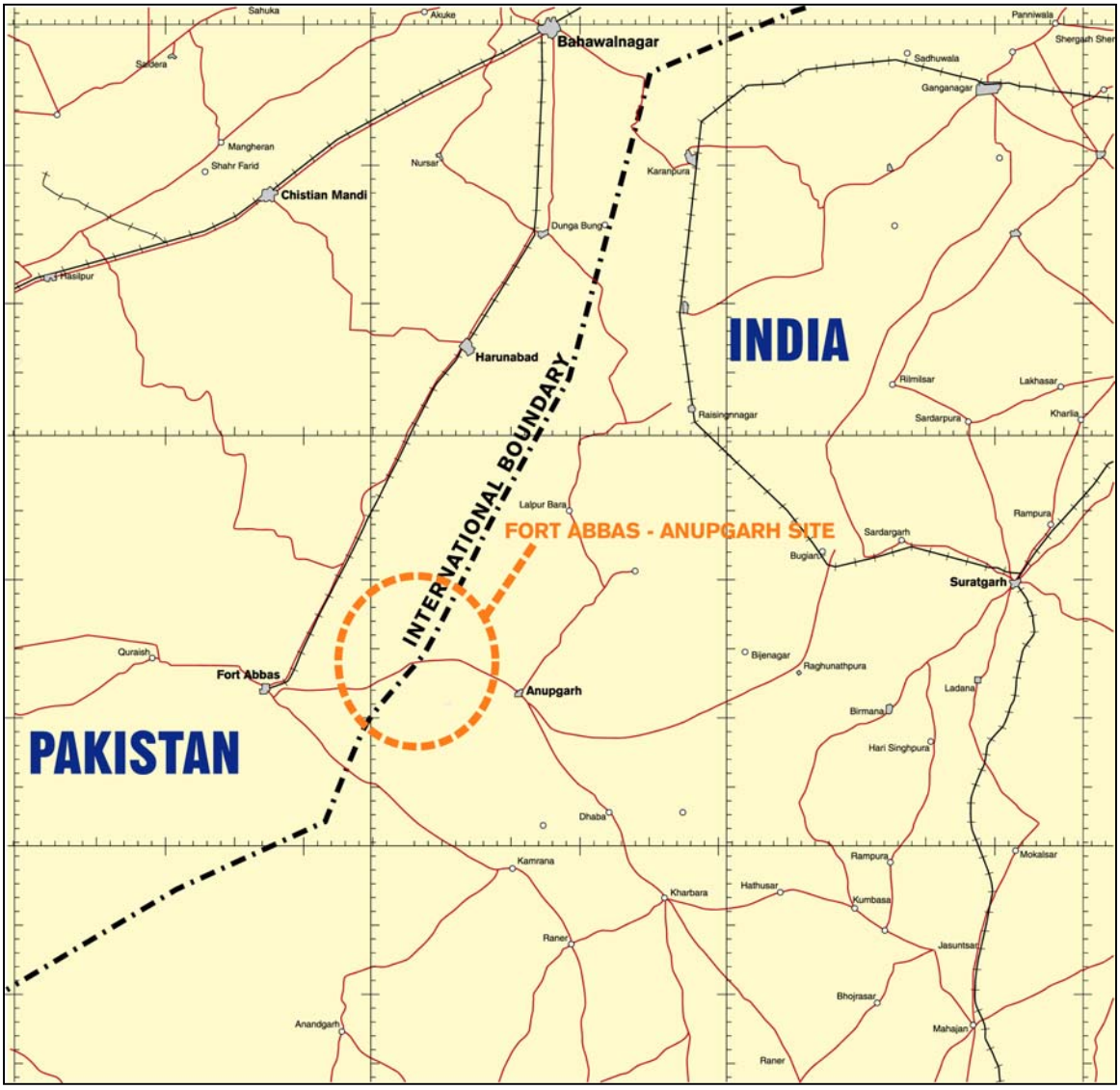

Figure 4. The Fort Abbas-Anupgarh Sector

3. Chakothi-Uri Sector (Figure 5). This is a sector of the LOC through which the Jhelum River flows from Indian-controlled Kashmir to Pakistan-controlled Kashmir. A winding road runs along the Jhelum River, which before partition was a major artery connecting Muzaffarabad with Srinagar. Unlike the two sites on the international border, this site is mountainous. While paramilitary border security forces man the international border, the LOC is manned by regular military troops. Presently quiet, this sector of the LOC has seen active hostility in the form of exchange of small arms fire and artillery dueling.

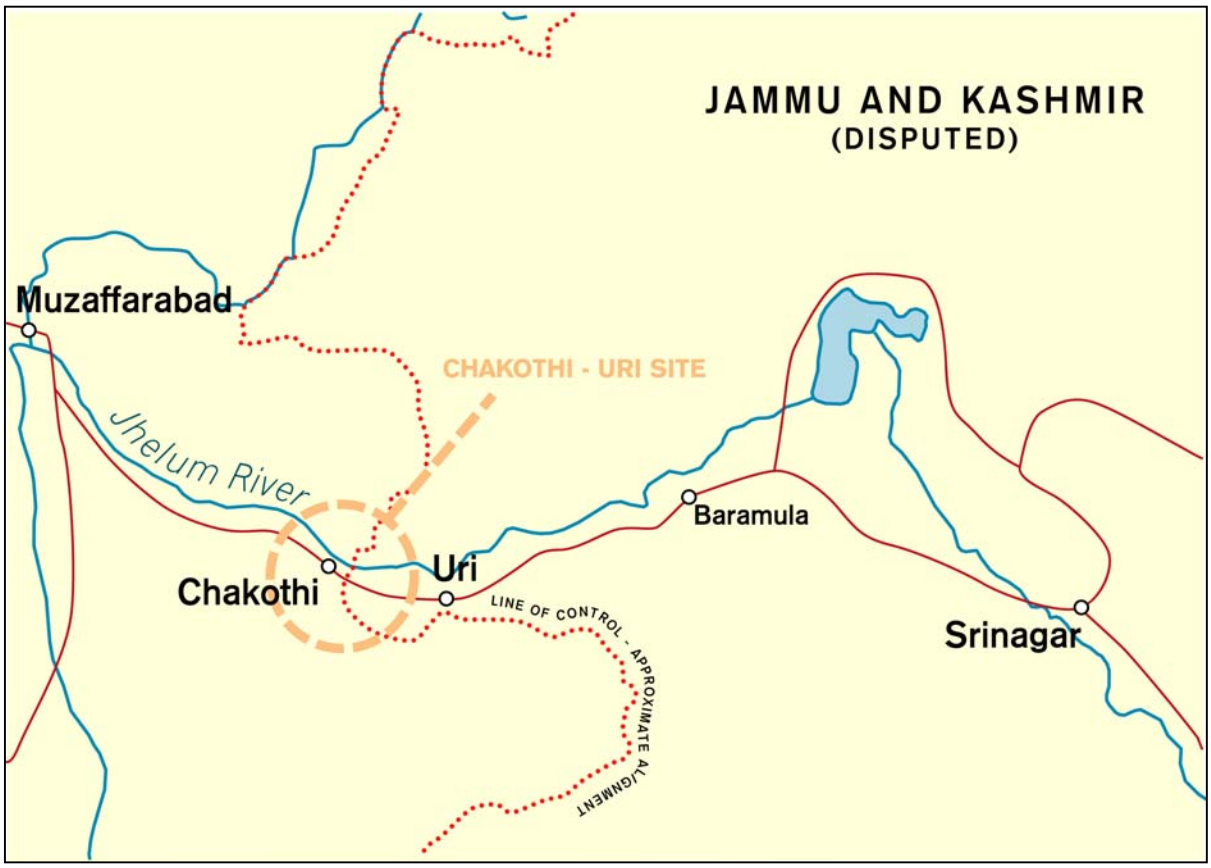

Figure 5. The Chakothi-Uri Sector

4.4. Visit to Experiment Sites and Interviews

From November 2000 to March 2001, the author held discussions with various officials and ex-officials in Delhi and at various places in Pakistan. The author, a resident of Rawalpindi, Pakistan, traveled to Delhi twice, once in November 2000 and again in January 2001. The author also visited the three proposed experiment sites from the Pakistani side, for reason of convenience. The Wagha-Attari site was visited in January 2001, the Fort Abbas-Anupgarh site in February 2001, and the Chakothi-Uri site in March 2001. Details are described below.

1. The officialdom in Pakistan, particularly at the Army headquarters, the Punjab Rangers headquarters, and subordinate units, were very open and supportive of this project with some reservations about its timing. They gave freely of their views and outright support to the author to visit the three sites. In Pakistan, the author was able to obtain the views of the senior

leadership and also the views of the officers actually manning the international border and the LOC.

2. Against the backdrop of Kargil and the high level of tension between India and Pakistan, the Indian officials were less willing to discuss the subject at that time, while the ex-officials shared their views without reservations. On the author's second trip to Delhi (January 2001), he was able to meet with a few serving officials and a large number of ex-officials. Amongst the serving officials were two senior Border Security Force (BSF) officers, a serving BSF Inspector General, and a retired BSF Inspector General, in addition to a large number of senior retired military officers and retired bureaucrats. During the second trip, the author also met with and obtained the views of a recently retired Indian Army Chief on the border monitoring experiment.

3. The vast majority of officials interviewed in India and Pakistan were supportive of the cooperative border monitoring concept. They felt that the cooperative border monitoring experiment could be a very useful step for reducing the high level of mistrust between the armed forces of India and Pakistan and moving from a relationship of confrontation to one of collaboration. However, almost all the officials in India and Pakistan felt that the present state of the relationship would not support the experiment when there is almost zero contact between the political leadership of the two countries. They also felt that the present level of confrontation and tension is bound to dissolve after a few months and pave the way for confidence building measures like this cooperative border monitoring experiment. As this document enters the final phase of editing, the Indian Prime Minister has extended an invitation for talks to his counterpart from Pakistan. The Pakistan Chief Executive has accepted the invitation.

4. A few retired Indian officials felt that the experiment should be expanded to support the welfare, education, and health of the people living on both sides of the border. Without doubt, the border security forces of both countries could play an important role in improving the quality of life of the poor farming communities on both sides of the border, including both the international border and the LOC.

5. After visiting the three sites, the author concluded that the type of monitoring systems and tasks would have to be tailored for each site. Site visits and discussion with the troops manning the LOC brought home that while the international border is fairly stable, the LOC is essentially a cease-fire line between two opposing armies in eyeball contact. Presently it is also a policy of both the governments not to give the LOC a permanent status as they consider the whole of Kashmir a disputed territory. In addition, because the terrain throughout the length of the LOC is mountainous, cooperative monitoring here would be limited.

6. Questionnaires were submitted in advance to various officials interviewed, especially those who were directly involved with manning the border presently or in the past. Appendix C contains sample questions.

4.5. Management of the International Border

The India-Pakistan international border does not follow any geographical feature. At places, it follows a river and at other places it follows administrative and sub-administrative boundaries of pre-partitioned India, particularly in the partitioned Punjab. Border pillars (BPs)

demarcate the international border between India and Pakistan. These concrete pillars are numbered sequentially from north to south. The first border pillar, referred to as BP 1, is at the northern tip of divided Punjab (Pakistani and Indian Punjab) and the southern-most border pillar BP 1175 is in the Rann of Kutch, overlooking the Indian Ocean and the disputed territory of Sir Creek.[7]

Paramilitary border security forces of both countries manage the international border. The Government of India has tasked the BSF with manning the international border; the Pakistan Rangers look after the international border on behalf of the Government of Pakistan. Both these forces are under the control of the respective Ministries of Interior. The Indian Police Service provides the senior leadership of the BSF while the Pakistan Army provides the senior leadership of the Pakistan Rangers.

For the ease of management of the border, both countries have divided the border into geographic regions. India has four regions (Jammu, Punjab, Rajistan, and Gugrat) while Pakistan has two regions (Punjab and Sind). Each Indian region is commanded by an Inspector General while a Director General commands each of the Pakistani regions.

Both border security forces are patterned on lines similar to light infantry. The basic unit of the BSF is the battalion while that of the Rangers is the wing. The Indian BSF battalion is authorized about a thousand personnel while the Ranger Wing has nearly 800 personnel. Both the border security forces man border posts that are strung along the border. Both have observation towers to provide better visibility across the border. Border posts vary in strength but the average post is about a platoon strong.

The area between the border posts of the respective countries is patrolled by foot patrols during daylight hours. At night at selected places the equivalent of "standing patrols," referred to as "nakas," are employed.

India has fenced a major section of the international border from BP 1 to about BP 930, a distance of about 1,900 kilometers. The 12-foot-high fence has been erected approximately 100 to 300 meters within the Indian territory. Gates in the fence allow farmers to enter their land to work and allow the BSF personnel to patrol the strip of Indian territory in front of the fence. With the fence in place, Indian cattle almost never cross into Pakistan while it is common for Pakistani cattle to stray into the strip of Indian territory between the fence and the border. The straying of Indian persons into Pakistan has also been minimized. Pakistan has not erected any border fence. However, in spite of the fence, smugglers and unauthorized personnel cross the border. Stories of intelligence agents and double agents abound in the villages on both sides of the border. Many times, smugglers also perform the role of spies. The BSF personnel cover the fence with observation towers and searchlights. Figure 6 shows a section of the Indian fencing along the border.

[7] The Sir Creek dispute involves defining the international boundary along the Sir Creek, a 100-km-long estuary in the saline wetlands of the Rann of Kutch between the state of Gujurat in India and the province of Sind in Pakistan. The dispute predates the creation of India and Pakistan and stems from a dispute between the British Indian State of Bombay and the Princely State of Kutch in the first decade of the 20th century.

To manage the border amicably, both sides operate under a set of mutually agreed rules called "Border Ground Rules of 1960," as revised in 1961. These rules, besides restricting military activity close to the border, define procedures for resolving issues and holding meetings between the two forces at various command levels.

Figure 6. Indian Fence on Border Area (as seen from Pakistan)

Members of the border security forces meet each other from time to time, either through impromptu or scheduled meetings. The impromptu meetings are normally held at the lower levels of command (wing, company, and platoon) to resolve day-to-day problems as they arise. Scheduled meetings are held monthly, quarterly, and biannually, at different levels of command. Since the Kargil crisis (May 1999) and up to the writing of this report (June 2001), the border meetings are the only formal bilateral forums where officials of the two countries meet. The scheduled and impromptu meetings are described below:

Monthly Meetings—The opposite commanders at the level of the Wing Commander from Pakistan and the Battalion Commandant from India hold monthly meetings. The meetings are held to discuss problems, resolve disputes, and chalk out a program for coordinated patrolling.

Quarterly Meetings—Quarterly meetings are held at the next higher level, that of the Deputy Director General of Rangers from Pakistan with the Deputy Inspector General BSF from India. The principals in this meeting are at the one-star level. These meetings are used to review and resolve cross-border disputes and problems.

Biannual Meetings—These meetings are held every six months, alternately in Lahore (Pakistan) and Jallunder (India), at the level of the Director Generals of Rangers from Pakistan with Inspector Generals of BSF from India. Discussions at this level include issues such as illegal entrants, repatriation of people who inadvertently cross the border, non-release of cattle by the other side, unprovoked heavy firing by one side or the other, refusal to hold flag meetings, etc.

Impromptu Meetings—These meetings, in the form of flag meetings, are held at the lower levels to resolve petty problems that crop up on a day-to-day basis or to complain about some action or inaction by the other side.

Unfortunately, in spite of the very cordial atmosphere[8] at all BSF–Ranger meetings and the rhetoric to cooperate, very rarely are substantive issues resolved during these meetings. When officials and ex-officials on both sides of the border were asked to explain the lack of resolution of problems, the author was informed that the meetings between the officials of the security forces were hostage to the overall negative atmosphere that prevailed between the two countries.

[8] The general atmosphere during the meetings, especially during the meetings between the senior commanders, is very cordial. A typical preamble of a meeting on the Indian side of the border would read: "Inspector/Deputy Inspector General of the BSF from India welcomed the Pakistani delegation and hoped that this meeting would provide an opportunity to communicate directly with the other side to review various problems in an atmosphere of mutual confidence. He further said that BSF were making earnest efforts to maintain good working relations, peace, and harmony and emphasized that both forces need to carry on with this policy of cooperation to strengthen the atmosphere of mutual cooperation." The leader of the Pakistani delegation would respond by reciprocating with equal warmth the goodwill and friendly feelings to ensure a good working relationship among the security forces. A similar cordial exchange would also occur if the meeting were to be held in Pakistan.

The overall environment at the international border is fairly peaceful. Very rarely is small arms fire exchanged between the two sides. Both sides have been known to fire upon and at times kill people who were considered illegal entrants. Opposing security force commanders at the junior levels (battalion, company, and platoon) are generally known to each other by name and enjoy a fairly cordial relationship. Because of the interaction at the biannual meetings, the relationship between the opposing senior commanders (Director General and Inspector General) is also cordial and commanders at this level have been known to help each other resolve impromptu problems.

In a case personally known to the author, a senior citizen (a retired major of the Pakistan Army) strayed into Indian territory close to Lahore while visiting his agricultural farmland along the border. On the request of the relevant Director General of Pakistan Rangers, the senior citizen was returned the next morning to Pakistan after having been questioned, dined, and provided a breakfast of his choice. This was done by the Indian Inspector General in response to a personal request of the Director General of the Rangers, essentially a personal IOU. This would not have happened on the LOC.

4.6. Management of the LOC

The LOC divides the former princely state of Jammu and Kashmir into Indian-controlled Kashmir and Pakistan-controlled Kashmir. It twists and turns crazily over rugged, mountainous terrain, rising steeply to snow-capped peaks and plunging into deep gorges, rarely following geographic features. Generally the area of the LOC is wooded. The combination of terrain and vegetation restricts visibility. The LOC is essentially the cease-fire line of July 1949, somewhat modified after the 1971 Indo-Pak war and converted into the LOC by the Simla Agreement. No boundary pillars mark the LOC.

Unlike the international border, the LOC is a hot border manned by regular army troops on both sides. Deliberate small arms firing to inflict casualties has been a common occurrence along with frequent and deadly artillery dueling. Both armies are deployed in proper defensive positions with depth locations and reserves at various levels. In some areas, protective minefields have also been used. Civilians on both sides of the LOC suffer casualties from small arms and artillery fire. The current (March 2001) cease-fire announced by the Indian government against the militants fighting inside Indian Kashmir and the restraint announced by Pakistan along the LOC has reduced firing along the LOC to a great extent, needless to say to the relief of the civilians who reside along the LOC.

There is nominal contact between the troops deployed along the LOC who are within shooting distance of each other. Contact is through flag meetings and is authorized by the senior military command. Initiative to contact the opposing commander at the middle and junior level of command is restricted. Communication between the opposing forces along the LOC is essentially through the hot line at the level of the respective army headquarters. In March 2001, during the author's visit to the LOC in the Chakothi-Uri area, he was surprised to learn that a telephone link connecting the company headquarters is maintained religiously by both sides and is tested once every month through the mechanism of the flag meeting. The author was informed that this tele-link was maintained even when there was active hostility in the form of exchange of

small arms and artillery fire; however, it has not been used in recent times, except to test its operation.

The United Nations Military Observer Group in India and Pakistan (UNMOGIP), established by a resolution of the UN Security Council in 1951, is inadequately staffed, but continues to monitor the LOC. Military authorities in Pakistan continue to lodge complaints about violations of the cease-fire with UNMOGIP. India, on the other hand, has restricted the activities of the UNMOGIP observers and has not lodged any complaints since January 1972. The Indian authorities hold the view that the mandate of UN observers has lapsed since their employment related specifically to the CFL under the Karachi agreement. Thus, UNMOGIP performs a limited role in controlling tensions along the LOC.

4.7. Management of the Siachen Zone (Line of Contact)

The Siachen Zone is not managed in the classical sense. It is, in fact, an active combat zone where the two armies face each other. The zone is managed essentially through the barrel of a gun and by the limitations imposed by terrain and weather. There has never been a formal cease-fire here nor does any formal agreement exist to manage Siachen. There are no flag meetings of commanders. However, the general *line of contact* established initially since 1984 by Indian and Pakistani troops remains undisturbed because both armies struggle to sustain their forces in this extremely inhospitable area and do not have the ability to evict each other. Siachen is essentially a disputed territory, arising out of different interpretations of a notional line, which was never marked on the map and even less so on the ground. In the 1949 cease-fire agreement, it was loosely defined as a "line northward from NJ 9842…."

Cooperative monitoring of Siachen would be a herculean task. The logical answer would be to achieve a political settlement or demilitarization of the Siachen Zone pending a political settlement. Kent L. Biringer, in a CMC Occasional Paper, has presented a novel solution to the Siachen dispute.[9]

5. Cooperative Monitoring Experiment

In a recent study conducted by Shirin Tahir-Keli and Kent Biringer,[10] cooperative monitoring applications for the total Indo-Pakistan border, including the LOC and the Siachen, have been discussed in broad terms. This study moves beyond the Tahir-Kheli/Biringer study to recommend specific cooperative monitoring experiments at three sites.

The recommendations have been tempered by the following factors:

1. The current level of cooperation (or the lack of it) at a specific site and what the prevailing political-military environments will accept.

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[9] CMC Occasional Paper 98-0505/2, *Siachen Science Center: A Concept for Cooperation at the Top of The World*, Kent L. Biringer, March 1999. Biringer's concept proposed the demilitarization of Siachen and the operation of a scientific research center cooperatively by India and Pakistan, which would be dedicated to scientific research in the fields of astronomy, geology, glaciology, physiology, etc.

[10] CMC Occasional Paper 98-0505/17, *Preventing Another India-Pakistan War: Enhancing Stability Along the Border*, Shirin Tahir-Kheli and Kent L. Biringer, October 2000.

2. The applicability of the specific technologies and monitoring concepts to a specific site.

3. The applicability of the recommended cooperative monitoring experiments in other areas of the India-Pakistan border.

5.1. Appropriate Concept and Technologies

The fundamental concepts for this cooperative monitoring experiment are the encouragement of human interaction, sharing of verifiable information, building the experiment using existing systems and procedures, and using appropriate technologies, with the ultimate objective of moving from a state of confrontation to a spirit of cooperation.

Human Interaction

Through personal interaction with serving and retired uniformed personnel on both sides of the border, the author came to the firm conclusion that the misperceptions on both sides about the motives and intentions of the other are deeply clouded by inaccurate prejudices. Some prejudices are historic and other prejudices were created by labeling the other side as the enemy, an enemy who is devious, treacherous, cruel, and totally untrustworthy. Such is the nature of conflict. A review of the printed (newspapers, books, etc.) and visual (films) media reports of the World War II era and, more recently, of the Cold War, bear witness to this state of mind.

It is equally true that misconceptions and misperceptions that have marred a relationship can be slowly changed through a deliberate effort of improved human interaction. The present level of interaction between the uniformed forces of India and Pakistan, may they be the border security forces or the regular army troops, is very limited, very narrow, and comes through biased prisms of perception. At the time of the border visits by the author (January through March 2001), the interaction between the officialdom of India and Pakistan was at a low point. An objective of this experiment is not to just return to the pre-Kargil level of the relationship but to expand it considerably, though in a controlled fashion, at multiple levels of command.

Sharing of Information

The spirit of the cooperative monitoring experiment is the collection, analysis, and sharing of information amongst parties. Both the signatories to a cooperative monitoring regime must have equal access to data collected through monitoring. Incorrect or incomplete information may be more damaging to a bilateral relationship than no information.

In cooperative monitoring, information is collected jointly through various verifiable means and shared equally by both parties. Shared information envisages openness, reduces the level of mistrust, and is an effective confidence building measure. Shared information is obtained through jointly operated sensors and human contact.

There are two options for the collection and sharing of information derived through various technical means. Ideally, India and Pakistan could have one common control center that they would operate and control jointly. The second option would be to have independent control centers within their respective territories to review and share data acquired through common

technical means. With the present level of relations, it would be unrealistic to expect the two parties to share a common reviewing facility. The second option is recommended.

Building on Existing Systems and Procedures

It is often easier and better to build on existing systems and procedures rather than try something totally new. In the Indo-Pak context, examples of cooperative monitoring and sharing of information already exist and can be further improved. The existing arrangement of joint patrolling along the Indo-Pak international border is an example. Monthly, quarterly, and bi-annual meetings could be made more meaningful through shared information.

While procedures and systems already exist along the international border, there are very few systems and procedures on the LOC to build on. At the Siachen Zone, for reasons of terrain, climate, and the open conflict, very little is possible in terms of implementing a cooperative monitoring experiment. The monitoring systems should be devised so that they are incremental and flexible. A separate monitoring system would have to be devised for each of the three sites.

Appropriate Technologies

As mentioned earlier, all technologies cannot and would not be applied to all the three sites. This view is based on the experience of the author, acquired at the CMC, during his visit to the U.S.-Mexican Border and an evaluation of the India-Pakistan border. Sensor technology may range from simple (Figure 7) to complex. Technologies suggested for this monitoring experiment are presented in Table 2.

Figure 7. Acoustic Sensors on the LOC

While designing a technology-based monitoring system, a number of factors require consideration. In this situation, the fundamental purpose of the experiment is to develop a cooperative relationship between the opposing forces, and second, to control unauthorized crossing of the border between India and Pakistan and between India-controlled Kashmir and Pakistan-controlled Kashmir. The unauthorized crossing by vehicles is almost nonexistent. Unauthorized crossing occurs mostly by personnel who walk across, either by design or inadvertently. Another issue is the crossing over of farm animals, such as cattle, goats, sheep, camels, etc.

Secondary factors that influence the design of any monitoring system are the topographic, soil, and climatic conditions. To make the monitoring system reliable, sensors should be used in combination with each other. A level of redundancy also needs to be built into the system. The monitoring system design should allow quick assessment of the situation and enable a quick response. The response could be in the form of dispatching a patrol to confirm the assessment and take necessary action or it may be a telephone call to the corresponding commander on the other side of the border. The author kept these factors and issues in mind while considering each specific experiment.

Sensors deployed in populated areas may be vulnerable to theft, vandalism, or damage due to civilian presence, agriculture, construction, or vehicle and foot traffic. If the presence of civilians is expected in the monitoring system's operational environment, protective measures should be taken to prevent monitoring equipment from being damaged or stolen.

Table 2. Technologies Suitable for the India-Pakistan Experiment

Seismic Sensors	
 	**Seismic sensors** detect low-frequency seismic energy in the ground caused by something moving their detection area. The nominal detection range varies from 9 m (human) to 35 m (vehicle) with actual detection ranges depending on the geology of a specific location. Naturally occurring seismic shocks may cause false alarms. *Communications:* Each seismic sensor has an identification code that is used when reporting back to the control center. Radio frequency (RF) transmission communications can transmit data up to about 25 km line-of-sight. *Power Requirements:* 12 volt DC from either AC line or battery power.
Magnetic Sensor	
	**Magnetic sensors** detect the change on the earth's magnetic field caused by the presence of an iron object. The level of change in the magnetic field is a function of the object's mass and distance from the sensor. Detection ranges from 3 m (a rifle) to 20 m (a truck). Lightning strikes or operating electrical equipment may cause false alarms. *Communications:* Each magnetic sensor has an identification code that is used when reporting back to the control center. RF transmission communications can transmit data up to about 25 km line-of-sight. *Power Requirements:* 12 volt DC from either facility or battery power.

Table 2. Technologies Suitable for the India-Pakistan Experiment, continued

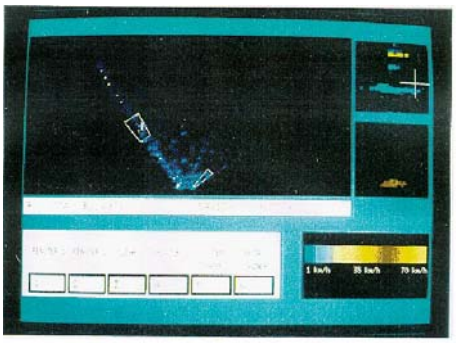
Ported Coaxial Cable	
	A **ported coaxial cable** creates an electromagnetic field around the cable. An intrusion disturbs the field resulting in detection. Up to 400 meters of cable may be deployed in a segment. Running water, heavy snowfall, or operating electrical equipment may cause false alarms. *Communication:* Alarm data can be sent over a hard wire or by wireless (telephone, radio, or microwave) modes. *Power Requirements:* 12 volt DC from either an AC line or battery power.
Ground Surveillance Radar	
 	**Ground Surveillance Radar** (GSR) is a phased array Doppler radar that can track multiple objects. The GSR is able to scan from 10 to 360 degrees and transmit real-time display information to a command center. Object detection and tracking varies from 10 km (human) to 30 km (vehicle). The system requires line-of-sight view of the object and can be blocked by natural obstacles. Harsh weather and areas with dense foliage may give false alarms (trees moving in the area, heavy rain, and snow). *Power Requirements:* AC power.

Table 2. Technologies Suitable for the India-Pakistan Experiment, continued

Sensor-activated Halogen Lights

Motion sensors activate lights to illuminate an area up to 240 degrees when an intrusion is detected. Harsh weather and wind-blown debris can activate the system, giving false alarms.

Power Requirements: AC power. Photocells enable the system to turn on only at night.

Video Cameras and Thermal Imagers

Example of the integration of both video cameras (daylight observation) and thermal imagers (day/night observation).

Video cameras transmit images either in digital or analog modes including under low light conditions. Lenses can zoom and automatically focus on objects. Optical capability is lessened under artificial illumination.

Communication: Can use hardwire or wireless communications to the control center.

Power Requirements: 12 volt DC from either AC line or battery power.

Example of video assessment using a thermal imaging camera.

A **thermal imager** displays infrared energy emitted by objects. It senses heat changes and generates real-time video pictures in all lighting conditions, including total darkness.

Power Requirements: 12 volt DC from either AC line or battery power.

Control Centers

All data will be transmitted from both the sensors and the cameras to control centers located on each side of the border. India and Pakistan would receive identical data simultaneously via radio transmission, hardwire connections, or a combination of the two.

The information gathered by the various monitoring devices would be analyzed and appropriate actions would be initiated. Distance and the landscape would dictate the communication method used. If the control center becomes unable to receive data, the sharing of data would be handled through policies established before the experiment begins.

The complexity of a control center depends on the type of monitoring it performs and the size of the area it observes. The control center should also contain a schematic display of how the sensors are deployed and have a mechanism to alert the operator when a specific sensor is activated. The center would also have one or more video monitors to display real-time video from a camera or review archived video that is associated with a specific sensor alert (see Figure 8). Multi-camera views could also be displayed using a video multiplexer. All data would be stored for a 24-hour period in a quick-review format. Older data would be archived and stored using a long-term data archiving method.

Figure 8. Example of a Control Center

The control center will require AC power and should have battery backups for short-duration power interruptions. Occasional testing of the communication systems, sensor display, and video would be needed to verify performance.

5.2. Cooperative Border Monitoring Experiment Site 1 – Wagha-Attari Sector

Located on the international border, the Wagha-Attari Sector boasts the only operating road and rail crossings between India and Pakistan. The road and rail links connect the city of Lahore in Pakistan with the city of Amritsar in India. This is the crossing site for the Samjhota (peace) Express train and also the crossing point for the bus service that was started with the visit of the Indian Prime Minister to Lahore in February 1999 (Figures 9 and 10). Despite the downward trend in the bilateral relationship after Kargil, the train service and the bus service continue to operate. The bus is fully booked in advance for three months and it is difficult to obtain a seat on short notice. The Samjhota Express was restarted in 1989 after cancellation in 1971. It operates four days a week, from India on Mondays and Thursdays and from Pakistan on Tuesdays and Fridays. Each service carries about 800 to 1,000 passengers and about 2,000 tons of cargo and baggage (Figure 11),[11]

Figure 9. The Wagha Road Crossing

[11] Information on the Samjhota Express was provided to the author on a visit to the Wagha railway station on January 3, 2001.

Figure 10. Transfer of Goods at the Wagha Crossing

Figure 11. Indian Freight Cars at the Wagha Railway Station in Pakistan

Because of the legal crossings at Wagha-Attari, there is a degree of coordination between various departments[12] of the two countries (Figure 12). However, intelligence agencies from both countries also have a sizable presence and are constantly lurking in the shadows, conducting their business. Coordination between the border security forces and the Railway Departments of India and Pakistan is significant. In fact, both border security forces conduct a coordinated and elaborate "retreat ceremony" that draws spectators from both India and Pakistan. This ceremony has now become a tourist attraction drawing crowds from Lahore and Amritsar.

Figure 12. Offices of the Indian and Pakistani Train Examiners at Wagha

Because of the proximity of a major city on either side of the border and the well-developed infrastructure, this sector boasts sizable smuggling traffic through both the legal and illegal crossing points. It is difficult to say whether the high incidence of smuggling is because of the numerous departments or in spite of them.

This site, in the opinion of the author, presents the best opportunity to launch a fairly elaborate border monitoring experiment. To keep the experiment manageable, six kilometers of the international border would be monitored jointly. This site can be divided into three clear sub-sites, i.e., the road crossing, the railroad crossing, and the area about two kilometers north and south of the rail and road crossings. For details, refer to Figure 13.[13]

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[12] The departments from India and Pakistan that have an overt presence at Wagha and Attari are the immigration, customs, railways, and security agencies (BSF and Rangers).

[13] The border monitoring experiment described in this section is designed to facilitate cooperation between the border security agencies. After the level of relations improves, in a subsequent phase, the experiment could be expanded to other areas. These initiatives could build on common Indian and Pakistani goals in preventing the smuggling of railway departments and border security agencies. A basis for cooperation already exists between the

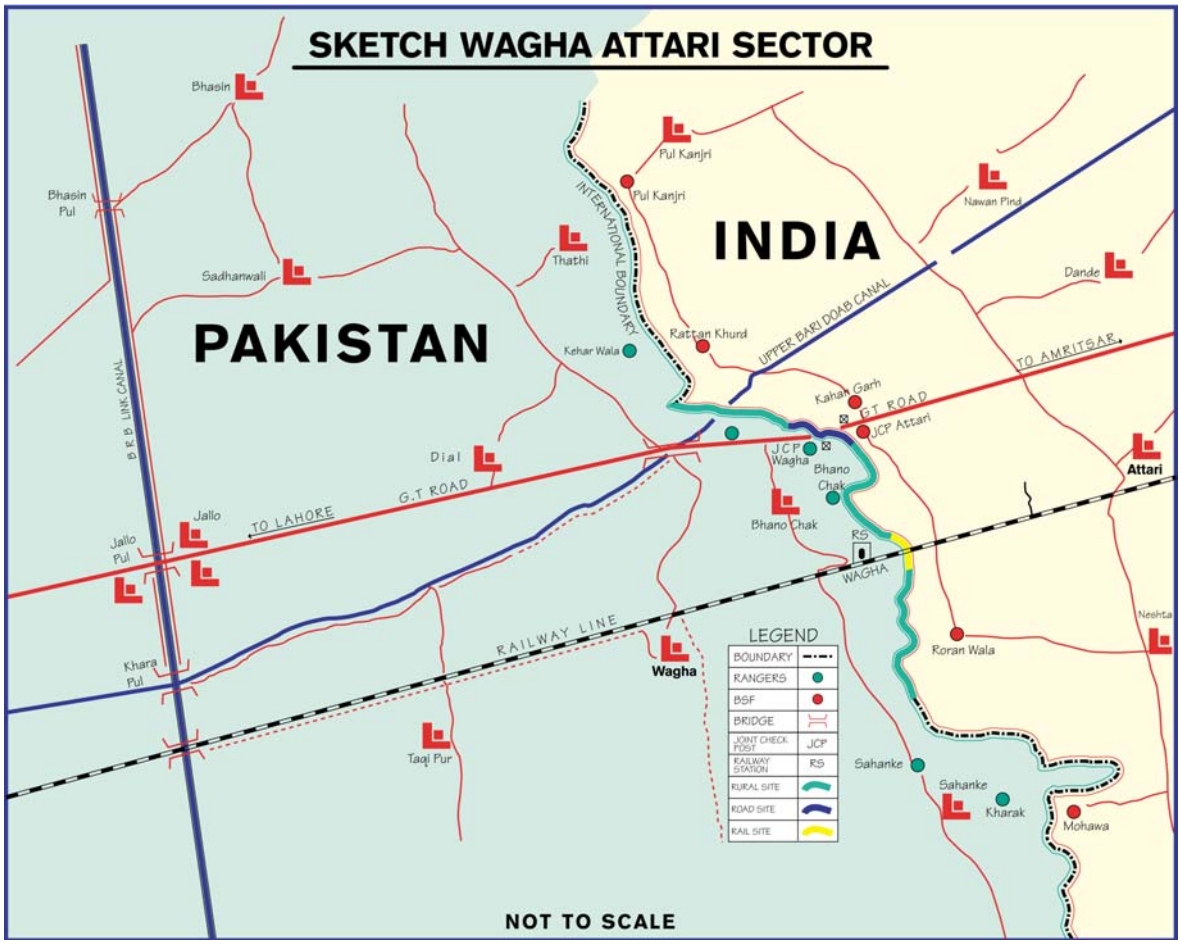

Figure 13. Sub-Sectors in the Wagha-Attari Sector

Site Monitoring Objectives

Cooperative monitoring at this site would be designed to fulfill the following monitoring objectives:

- Assist in controlling smuggling.
- Reduce crossing by unauthorized personnel.
- Support the border security elements in reducing inadvertent crossing by uniformed personnel or civilians.
- Identify inadvertent crossings of farm animals (cattle, camels, sheep, etc.) and assist in their return.

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railway departments and border security agencies. Customs agents might jointly inspect and seal cargo containers when the train is loaded, thereby reducing the border inspection to verification of the seals. Inspection effectiveness could be improved by passing containers through gates where sensors monitor for hidden illicit items using chemical and radiation detectors. Such monitoring can also be applied to people using systems analogous to airport security checkpoints with added capabilities to detect drugs, explosives, and radioactive material.

- Develop a higher degree of trust between the BSF and the Punjab Rangers.
- Establish systems and procedures for conflict resolution.
- Assist the BSF and the Punjab Rangers in improving efficiency at the road and rail crossing sites.

Figure 14 is a schematic of the proposed monitoring experiment at the Wagha-Attari site.

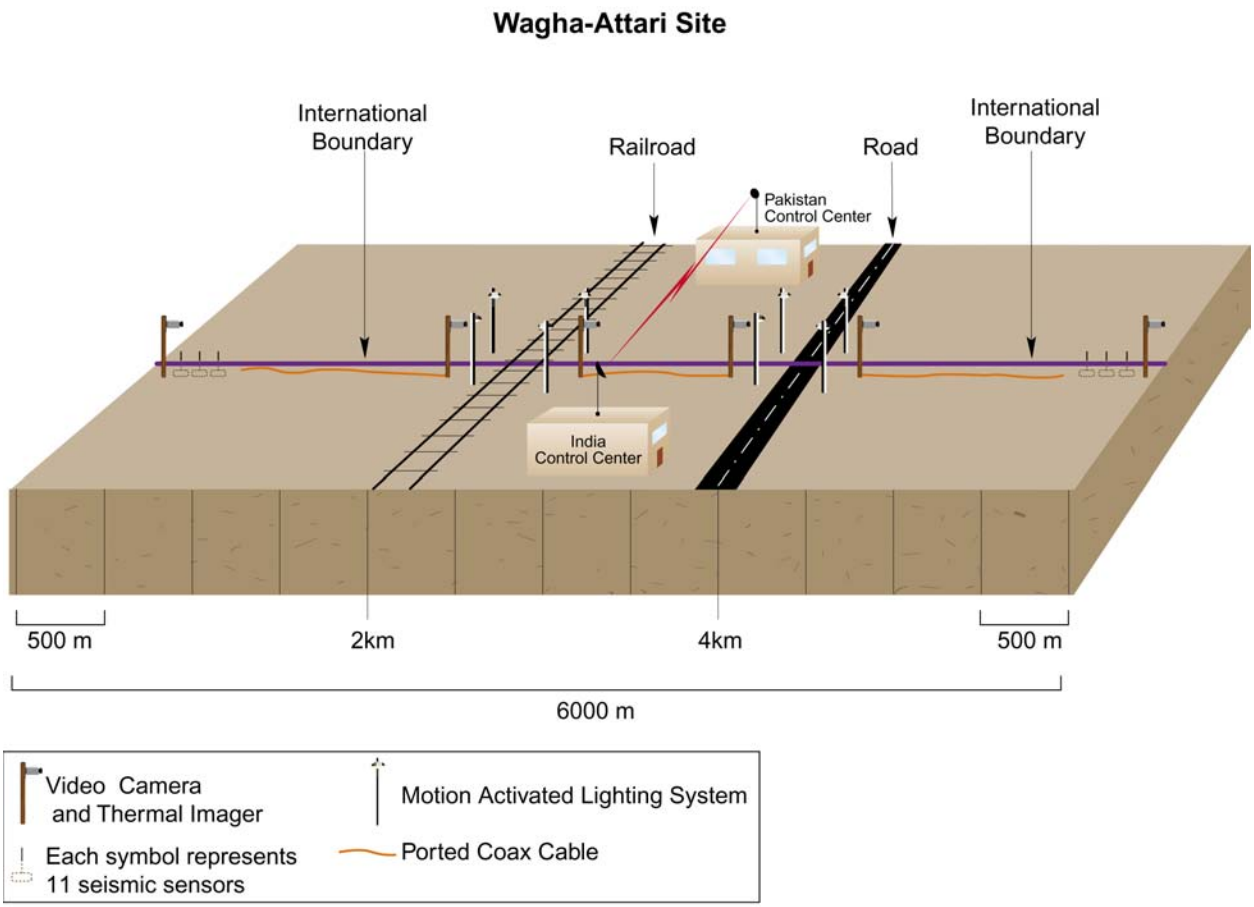

Figure 14. Schematic of Proposed Monitoring Experiment at the Wagha-Attari Sector

Road Crossing Sub-Site

This sub-site would consist of an area of about 500 meters on either side of the road. The following technologies are recommended for use in monitoring this area:

- A direct telephone connection (hot line) between the two (India and Pakistan) sub-site commanders (platoon/company)
- Video cameras and thermal imaging
- Stadium lights with motion sensors
- Seismic sensors
- Ported coaxial cable

Rail Crossing Sub-Site

This sub-site would also consist of an area of about 500 meters on either side of the main railway line. The following technologies are recommended for use in monitoring this sub-site:

- Video and thermal monitors
- Ported coaxial cable[14]
- Stadium lights with motion sensors
- Telephone—A telephone connection already exists between the Railway Station Masters on the Wagha and the Attari railway stations. However, it operates during limited periods of time.

Rural Sub-Site

This sub-site would be the area of the border about two kilometers north of the road sub-site, an area about two kilometers south of the rail-crossing sub-site and in between the road and the rail crossings. The following technologies are recommended for use in this area:

- Video cameras and thermal imagers
- Stadium lights with motion sensors
- Seismic sensors and ported coaxial cable[15]

[14] The rail site would use a buried ported coaxial cable sensor rather than seismic sensors. Unlike the other sites, this area has significant ground vibration because of the rail car movement. Seismic sensors without discriminators can be activated by heavy machine vibration up to 1.5 km away.

[15] The rural site would use a combination of seismic sensors and ported coaxial cable because of the proximity of the road and rail crossings. The passage of heavy vehicles would activate seismic sensors if they were placed near the

Control Centers

At the Wagha-Attari Site, a control center for each country would be manned around the clock and connected to each other through a direct telephone line. For convenience, the control centers could be located a few hundred meters to the rear of the crossing sites on the road, or co-located with the platoon/company headquarters of the BSF and the Punjab Rangers. Sensors and monitoring systems could be connected to the control rooms through ground cables, ultra-high frequency (UHF), or microwave connections.

5.3. Cooperative Border Monitoring Experiment Site 2 – Fort Abbas-Anupgarh Sector

This sector is located on the international border about 300 kilometers south of the Wagha-Attari Sector, bordering the semi-desert areas of both Pakistan and India. The northern part of this sector is cultivated while the southern portion is semi-desert scrub. The level of cultivation is higher on the Indian side of the border.

Unlike the Wagha-Attari Sector, there is no authorized crossing point between the two countries in this sector. Because of the nature of the area, the infrastructure in this sector is relatively poor and the population density low. The incidence of smuggling in this sector is also low. The main problem confronting the border security forces in this sector is the inadvertent crossing of cattle and people. The Fort Abbas-Anupgarh Sector represents the bulk of the Indo-Pak border, especially the border south of this site (see Figures 15 and 16).

Figure 15. International Border at Fort Abbas-Anupgarh (viewed from Pakistan with Indian fence in background)

road, causing false alarms, so ported coaxial cable would be installed within 1.5 km of the crossings. Seismic sensors would be used at distances greater than 1.5 km from the crossings.

Figure 16. Pakistani Border Post at Fort Abbas as Seen from the Indian Side

Because of the openness of the terrain and the low level of activity, this cooperative monitoring experiment site design would be relatively simple and the site could extend to a total length of about 10 kilometers, centering on a notional line connecting Fort Abbas (Pakistan) with Anupgarh (India). Ideally, the experiment site should cover the precise area of responsibility of one BSF or one Punjab Rangers company for better coordination. As there is no specific crossing point at this time, the experimental site could be shifted easily a few miles north or south at the time of implementation. Refer to Figure 17.

Site Monitoring Objectives

The objectives of the proposed experiment site would be to:

- Reduce smuggling.
- Reduce crossing of unauthorized personnel.
- Support the border security elements in reducing inadvertent crossing by uniformed personnel or civilians.
- Identify inadvertent crossings of farm animals (cattle, camels, sheep, etc.)
- Develop a higher degree of trust between the BSF and the Punjab Rangers.
- Establish systems and procedures for conflict resolution..

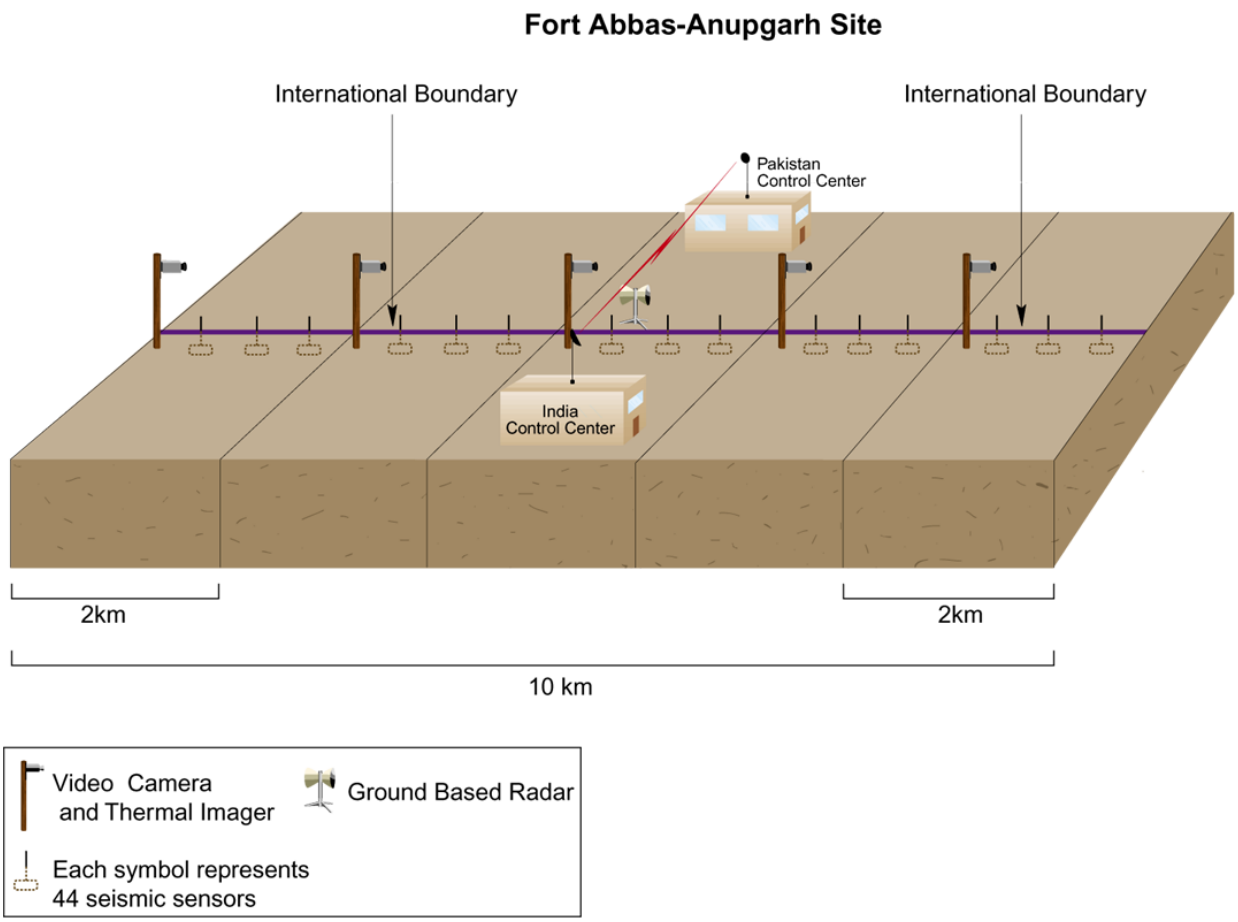

Figure 17. Schematic of the Proposed Monitoring Experiment at the Fort Abbas-Anupgarh Monitoring Sector

The following technologies are recommended for use at this site:

- Ground radar for long-range detection and night use[16]
- Seismic sensors
- Optional video cameras for day use
- Ported coaxial cable

Control Centers

At the Fort Abbas-Anupgarh Site, there would be a requirement for a control center for each country, possibly co-located with the Indian and the Pakistani company-level headquarters at this site, again to be manned around the clock and connected to each other through a direct telephone line. Like the Wagha-Attari Site, the monitors should be connected through buried cables or VHF link.

5.4. Cooperative Border Monitoring Experiment Site 3 – Chakothi-Uri Sector

The Chakothi-Uri Site is fundamentally different from the two sites discussed earlier. First, this site is not on the international border but on the LOC. Second, the terrain is mountainous and wooded, very different from the open spaces of the Fort Abbas-Anupgarh and the Wagha-Attari Sectors. Third, unlike the international border, the LOC is manned by regular army troops on both sides of the border, with bunkers and trenches in place of border posts (Figure 18).

In this sector, the Jhelum River flows from Indian-controlled Kashmir to Pakistan-controlled Kashmir. A winding road runs along the Jhelum River, which before the partition of British India was a major artery connecting the States of Jammu and Kashmir with northern India (Figure 19). Figure 20 is a computer-generated, three-dimensional view using a LANDSAT satellite image and shows the Jhelum River crossing the LOC as viewed from Indian-controlled Kashmir. In March 1947, months before partition, the author of this study, as a young boy in the company of his father, traveled through this sector from a small town in Northern British India to attend his first school in Srinagar. This site has the potential to develop into a major crossing place for people and goods once peace returns to this region.

Figure 18. Pakistani Outpost in Kashmir in the Chakothi-Uri Sector (Jhelum River at right)

[16] Although the terrain at this site is flat, small ditches may mask an intruder who is crawling or crouching. Seismic or ported coaxial cable sensors should be placed at any terrain feature that might mask the radar beam.

Figure 19. Destroyed Bridge on the Muzaffarabad-Srinagar Highway at Chakothi

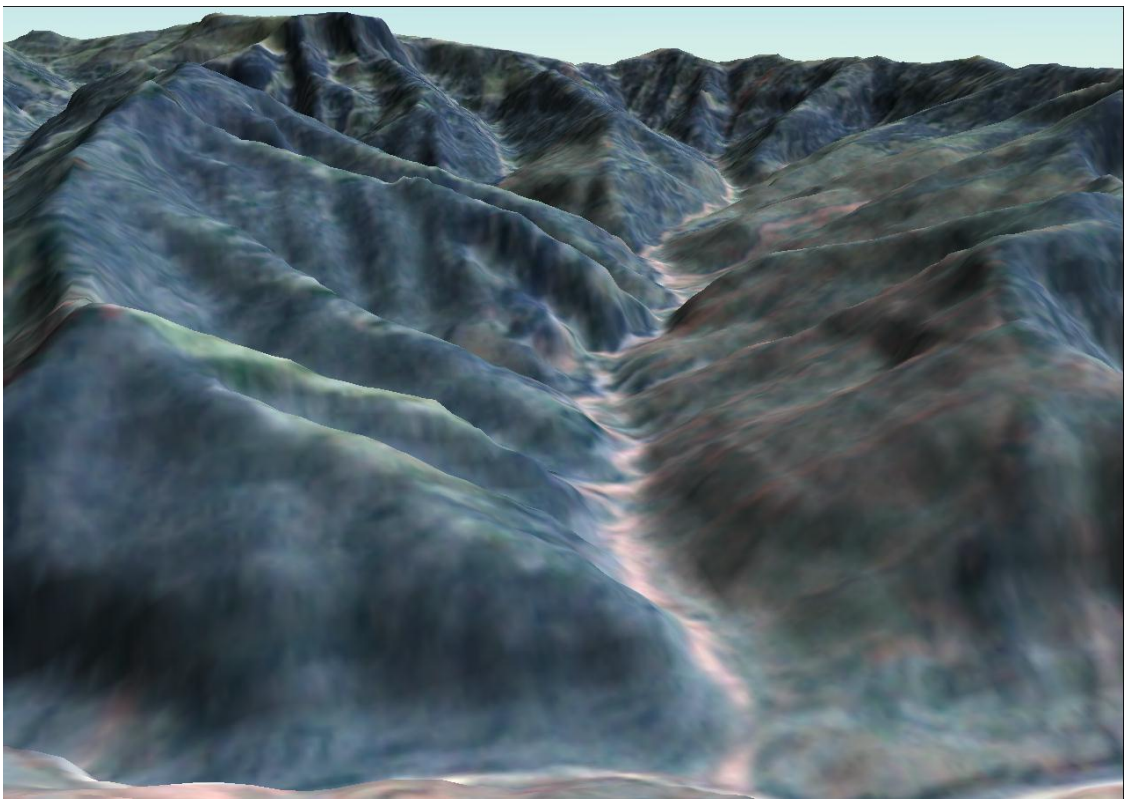

Figure 20. The LOC Area at Chakothi as Viewed in a Three-Dimensional Satellite Image (viewing south, Jhelum River in foreground)

The terrain in this sector is mountainous and wooded; therefore cross-country vehicular mobility is not possible (Figure 21). The terrain also forces people crossing on foot to follow

natural paths. There is no provision for legal crossings in this area; however, it is believed that unauthorized and clandestine foot crossings occur from both sides of the border. The fundamental issues in which cooperative monitoring in this sector could help are control of unauthorized and inadvertent crossing by individuals, reducing the existing level of tensions, reducing the high level of mistrust, and the settlement of minor disputes between the opposing forces.

Because of the nature of the terrain and the tense nature of the LOC, it would be difficult to achieve the degree of cooperative monitoring that is possible along the international border. Therefore, the concept for the border monitoring experiment in this sector is less intrusive and also less elaborate. With time and the development of confidence, cooperative monitoring could become more elaborate, demanding a higher degree of cooperation amongst the opposing forces.

Figure 21. Chakothi-Uri Sector Terrain (Jhelum River at left, India at right)

For ease of control, the author recommends the experiment focus on an area that corresponds to the deployed frontage of the Pakistani or the Indian infantry battalion that is deployed astride the Muzaffarabad-Srinagar road (approximately 6 to 10 km). Rather than cover the whole frontage, the author recommends that four likely crossing places (two on each side of the road) for unauthorized crossers on either side of the road be selected and monitored by ground sensors (Figure 22). Radio transmission repeaters may be required on mountaintops to enable line-of-sight transmission. To overcome any initial mistrust, it is recommended that the two opposing commanders be allowed to select one site on each side of the road along the LOC.

In addition, monitoring should be conducted where the Muzaffarabad-Srinagar road crosses the LOC. The author recommends that thermal imagers be deployed at this location to

enable night observation of the border area near the road and aid transparency. Each country would control the imager in its area including being able to change the field of view remotely from its control center. As with the ground sensors, it is recommended that each of the two opposing commanders be allowed to select the site of the thermal imager on his side of the LOC. The control centers for this site could be co-located with the respective battalion headquarters or any other sites acceptable to each commander.

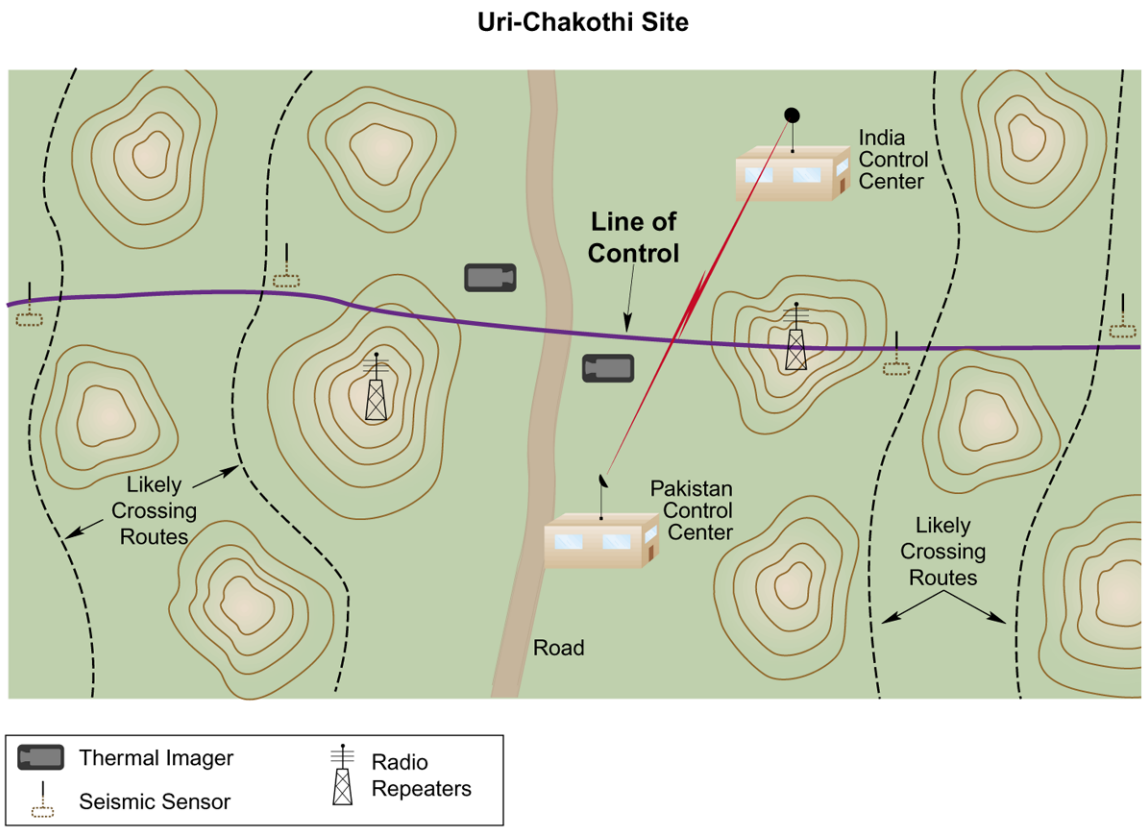

Figure 22. Schematic of the Notional Monitoring Experiment at Chakothi-Uri Sector

Site Monitoring Objectives

The monitoring objectives for the Chakothi-Uri Sector would be to:

- Develop a high degree of trust between the Indian and Pakistan Army personnel deployed in this sector of the LOC.
- Reduce the level of tensions and help de-escalate tensions when they occur.
- Reduce the number of crossings of the LOC by unauthorized personnel from either side.
- Establish systems and procedures for conflict resolution.

It is recommended that a monthly meeting be held between the opposing battalion commanders in this sector at a mutually agreed location to discuss the progress of the cooperative

monitoring experiment and to discuss any other issues that could reduce the tensions along their sector. The following technologies are recommended for use at this site:

- Seismic ground sensors
- Video and thermal imagers
- Wire telephone link between the opposing battalion commanders with radio communications as backup

Control Centers

Both control centers would receive messages from all the deployed seismic sensors by RF transmission. Each control center would only receive images from the thermal imager under its control. The Chakothi-Uri Sector would use the existing telephone link between the two company headquarters for communication between the two control centers. Radio communication should be available as a backup system.

6. Conclusion

Pakistan and India have fought intense wars and present a dismal record of the last fifty years of co-existence. However, there is one positive aspect of their relationship: agreements reached between the two countries have been honored by both. The agreement to share the waters of the Indus River[17] through an elaborate treaty signed in 1960 is a classic example. The border monitoring experiment presents another opportunity for India and Pakistan to collaborate with special advantages. First, this experiment would provide the armed forces of the two countries with the opportunity to work in an interactive fashion; second, it does not compromise any political position or stand of either country; and third, it would be an important bilateral agreement.

The broad purpose of this study has been to present practical ideas for a cooperative border monitoring experiment to help reduce border tensions and move the uniformed personnel of India and Pakistan from a state of confrontation to a state of mutually beneficial engagement. The study shows how technology can play an important facilitating role in enhancing security between two countries. If and when the political decision has been made by the leadership in India and Pakistan to accept the proposal of this study, a detailed technical survey of each site will be required in collaboration with the security forces from each country. Although the author recommends the experiment be implemented concurrently at three independent sites, it could be implemented at only one or two sites, as desired.

The study also provides contemporary models of successful cooperative monitoring. The two most striking examples of cooperative monitoring presented in this study are the INF treaty signed between the Soviet Union and the U.S. in December 1987 and the cooperative monitoring conducted in the Sinai peninsula after the Yom Kippur War of 1973. Sandia National Laboratories, of which the CMC is a component, played a significant role in the implementation of the INF treaty on behalf of the U.S. Government.

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[17] The Indus Water Treaty was signed on September 19, 1960, in Karachi (Pakistan) by the Indian Prime Minister Jawaharlal Nehru and the Pakistani President Ayub Khan.

After analyzing relevant parameters, the author selected three sites for the experiment. The selected sites would allow the monitoring experiment to be conducted in a variety of terrain conditions on the international border as well as on the LOC and in areas of different levels of border tensions. The selected sites would allow interaction between the paramilitary security forces (deployed at the international border) as well as the regular army troops (deployed on both sides of the LOC). All three sites are logistically supportable with fairly good approach roads (from both sides), telecommunication facilities, and readily available electric power.

The author discovered that among the personnel actually deployed on the border, especially at the international border, there was an eagerness to move forward into a cooperative relationship. A retired senior BSF officer in Delhi suggested that in a subsequent phase of the present proposal, the border security elements could assist the generally poor rural population living along the international border in developing mutually beneficial border trade. However, opinion at the policy level in both the countries was split down the middle. Some policy-level people were wary of this proposal because of the existing levels of mistrust and the current political stalemate. Even those who were wary of the experiment were supportive of its applicability once serious political dialogue commenced between the two countries.

In addition to the primary objectives of the study, the implementation of this study could derive the following additional advantages:

- Improve the quality of life of the people on both sides of the international border and the LOC.
- Eliminate the expenditures for active hostile acts (small arms firing, artillery dueling, physical raids/attacks on opposing force border posts, etc.), especially along the LOC.
- Reduce smuggling.
- Resolve minor border disputes before they become major problems.

Funding for the cooperative monitoring experiment would not be insignificant but the proposal is certainly affordable by India and Pakistan. In the long run, the economic benefits of the cooperative border monitoring experiment would definitely outweigh the initial expenditure to acquire the requisite monitoring sensors and their operation on the selected sites. It is the author's belief that some countries and/or foundations that support peace in the region may be willing to fund the technology portion of this project.

The nuclearization of India and Pakistan has raised the cost of conflict to unaffordable levels. Without verifiable reassurance, a minor border incident can result in overreaction, a corresponding retaliation, and a broader conflict. It is time for India and Pakistan to break from the past, bury the hatchet, resolve their disputes through dialogue, and move toward a collaborative relationship. The cooperative border monitoring experiment, if implemented, could play an important role in reducing the mistrust between the armed forces of the two countries and minimize the chances of an overreaction. The leadership of the border security forces on both sides of the border sees great advantage in a collaborative relationship; they await political direction.

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Appendix A—Lahore Declaration

Text of The Lahore Declaration signed by the Prime Ministers of India and Pakistan on February 21, 1999:

The Prime Ministers of the Islamic Republic of Pakistan and the Republic of India:

Sharing a vision of peace and stability between their countries, and of progress and prosperity for their peoples;

Convinced that durable peace and development of harmonious relations and friendly cooperation will serve the vital interests of the people of the two countries, enabling them to devote their energies for a better future;

Recognizing that the nuclear dimension of the security environment of the two countries add to their responsibility for avoidance of conflict between the two countries;

Committed to the principles and purposes of the charter of the United Nations, and the universally accepted principles of peaceful co-existence;

Reiterating the determination of both countries to implementing the Simla Agreement in letter and spirit;

Committed to the objectives of universal nuclear disarmament and non-proliferation;

Convinced of the importance of mutually agreed confidence building measures for improving the security environment;

Recalling their agreement of 23 September 1998, that an environment of peace and security is in the supreme interest of both sides and that the resolution of all outstanding issues, including Jammu and Kashmir, is essential for this purpose;

Have agreed that their respective Governments:

1. Shall intensify their efforts to resolve all issues, including the issue of Jammu and Kashmir.
2. Shall refrain from intervention and interference in each other's internal affairs.
3. Shall intensify their compositor and integrated dialogue process for an early and positive outcome of the agreed bilateral agenda.
4. Shall take immediate steps for reducing the risk of accidental or unauthorized use of nuclear weapons and discuss concepts and doctrines with a view to elaborating measures for confidence building in the nuclear and conventional fields, aimed at prevention of conflict.

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Appendix B—Cooperative Monitoring Center – An Overview

The following text was provided by the Cooperative Monitoring Center.

Introduction

The next twenty years will bring unprecedented demands and opportunities for international and regional cooperation on issues ranging from halting weapons proliferation to managing the environment and natural resources. A growing number of countries will be party to multilateral or regional cooperative agreements. Effective implementation of cooperative agreements will require acquisition, processing, analysis, and sharing of large quantities of information and data.

Such "cooperative monitoring" will become a vital component of security for individual countries, regions, and international institutions. However, many of these entities lack the basic experience and technical infrastructure necessary for full participation in cooperative regimes. Even technically sophisticated countries will require enhancement of existing information acquisition and management capabilities. A successful transition to a more cooperative world will present a complex technical and political challenge.

The Cooperative Monitoring Center (CMC) at Sandia National Laboratories in Albuquerque, New Mexico, has been established to help meet this challenge. Sandia's history includes a long-time involvement with U.S. treaty verification and monitoring programs, leadership in systems engineering for the U.S. nuclear weapons program, and leadership of U.S. nuclear stewardship activities. In combination with complementary expertise at other Department of Energy (DOE) National Laboratories, these activities have resulted in a unique systems-level approach to problem solving and a broad spectrum of technology-based tools that can be applied to the challenges of cooperative monitoring.

The Vision

The CMC provides a forum for international and regional experts to explore ways that technology can facilitate achieving and maintaining a wide range of bilateral, international, and regional security objectives. Technical collaborations on monitoring applications, coupled with an internationally recognized education and training program, help establish the regional and international infrastructure for cooperative security.

Visitors to the CMC receive hands-on experience with monitoring hardware, software, and data processing and integration capabilities for both arms control and environmental applications. Technologies demonstrated at the CMC are neither classified nor export controlled, and can be shared with most countries.

The CMC promotes communication by hosting sabbaticals, workshops, and training programs aimed at developing solutions to specific security problems. Current focus areas include designing monitoring systems for potential agreements in the Middle East, Northeast Asia, Central Asia, and South Asia, and enhancing the physical security of weapons-grade nuclear material in the Former Soviet Union.

The Mission

The CMC assists political and technical experts from around the world acquire the technology-based tools they need to assess, design, analyze, and implement nonproliferation, arms control, and other security measures.

Technical experts at the CMC assist U.S. and foreign experts in the design and evaluation of cooperative monitoring concepts and systems for applications meeting their specific needs. Collaborations on experimental monitoring systems are encouraged. The CMC also assists in the design and implementation of prototype cooperative monitoring systems for the U.S. Government and other countries or regions.

By drawing on the wide range of technical and analytical capabilities at Sandia, other DOE national laboratories, U.S. and foreign universities, and private industry, the CMC provides objective technical analysis and access to key technical capabilities for the U.S. Government and the international community.

Appendix C—India and Pakistan Questionnaire to Ascertain Views of Officials on the Issue of Cooperative Border Monitoring

1. Describe the frequency and structure of meetings with counterparts across the border and at what levels.

2. What are the reasons for seeking impromptu meetings, how often are they held, and what is discussed at these meetings?

3. What issues are discussed during the planned periodic meetings?

4. Are issues that relate to the security and quality of life of the people who live along the Indo-Pakistan border ever discussed?

5. Do the Rangers (Pakistan) and the BSF (India) share any information at the present time?

6. Do the deployed troops along the LOC (Kashmir) share any information at the present time?

7. What is the effect of the fencing by India along the international border? Does the fencing help reduce smuggling and inadvertent crossing?

8. What is the type and level of cooperation between the border security forces and other government departments (customs, immigration, railways, etc.) at the Wagha-Attari road and rail crossing?

9. Can the level of tension between the border security forces of India and Pakistan be lowered, and if it is possible, then how?

10. Can modern technology (unattended ground sensors, video cameras, night vision devices, communication, etc.) play a role in improving the management of the borders between India and Pakistan?

11. Is cooperative border monitoring between India and Pakistan a realistic goal, both at the international border and along the LOC?

NOTE: This list represents the type of questions asked to ascertain the views of a wide variety of people, both in India and Pakistan. The primary audience of the questionnaire were military commanders, both serving and retired, and commanders of the paramilitary security forces (BSF and Rangers) who man the international border between India and Pakistan. Because of the author's nationality, it was possible for him to contact serving commanders down to the battalion, company, and platoon (equivalent) levels in Pakistan.

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About the Author

Major General Mahmud Ali Durrani (Retd) was commissioned in the Pakistan Army in 1961 and retired in 1998. He held a variety of command and staff assignments, including the command of an armored division. While serving in an armored regiment, he fought in the 1965 Indo-Pakistan war and again saw action on the western front in the 1971 war. He served as Pakistan's Defense and Military Attaché in Washington, DC, from 1977 to 1982, and as President Zia ul Haq's Military Secretary from 1982 to 1986. He also served as chairman and chief executive of the Pakistan Ordnance Factories Board, the largest defense industrial complex of Pakistan, during 1992 to 1998. Presently, as part of a group of Indians and Pakistanis, he is working toward peace in South Asia. He is also involved with a UN-sponsored initiative to develop a peaceful solution of the Afghanistan conflict.

He specializes in military strategy, defense production and international security issues. He is the author of the book *India and Pakistan—The Cost of Conflict and the Benefits of Peace*, 2000, Johns Hopkins University and reprinted by the Oxford University Press in 2001. In 2000, he undertook a study for the Pakistan Army titled "Pakistan's Security Imperatives Year 2000 and Beyond." He has spoken in a variety of international forums on defense, security, and foreign policy. From November 1999 to January 2000, General Durrani was concurrently a visiting scholar at the School of Advanced International Studies (SAIC), Johns Hopkins University in Washington, DC and a visiting fellow at the Foreign Policy Research Institute in Philadelphia, Pennsylvania, USA.

He was educated at Burn Hall School, Government College Abbottabad, and the Pakistan Military Academy in Kakul.

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