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Impact of South-Asia's Nuclear Tests upon CTBT

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ABSTRACT

After long period's worldwide negotiation, the Comprehensive Test Ban Treaty (CTBT) finally opened for signature on Sept. 24th, 1996. The treaty stipulates that it may come into force 180 days after the date of deposit of the instruments of ratification by all of the specified 44 states. So far, except India, Pakistan and North Korea, all of the other ones have signed on the treaty. However, the nuclear tests conducted respectively by India and Pakistan have seriously shaken the CTBT. It is feared that the regional nuclear arms race would be triggered as a sequence of the test events and all these factors would eventually render the treaty effect-less and damage the efforts to promote arms control. The nuclear test events in South Asia have indicated and confirmed that there exist some technical flaws as well as political faults in CTBT. People should delve into the existing problems within CTBT to assure the effectiveness and function of CTBT when entering into force.

INTRODUCTION

After long time's hard negotiation, the Comprehensive Test Ban Treaty (CTBT) finally opened for signature on Sept. 24th, 1996. So far, 149 states have signed on the treaty, including 41 specified countries. Of the 44 specified countries, only India, Pakistan and North Korea have not signed on the treaty. India did conduct 5 nuclear tests on May 11th and 13th, 1998, not concerning the efforts of arms control and test ban. Subsequently, Pakistan announced its "forced" 6 nuclear tests on May 28th and 30th, 1998. The nuclear tests in India and Pakistan shocked the whole world, not only would they seriously damage the peace and stability in South-Asia, trigger nuclear arms race in this area, but also they would render the international nuclear nonproliferation system useless. The authors analyzed the nuclear tests in South Asia and CTBT to probe the impact of the tests upon CTBT.

BRIEF INTRODUCTION OF NUCLEAR TESTS IN SOUTH ASIA

India's Nuclear Tests

Based on the announcement of India's Department of Atomic Energy, the Defense Research and Development Organization (DRDO), the May 11 tests exploded 328 feet below the ground desert 336 miles (530 km) southwest of New Delhi were of a 12-kiloton fission device, a 0.2-kiloton device and a 43-kiloton thermonuclear device. The distance separating the shaft of the two large explosions was one kilometer. The yields of May 13 tests were 0.5 kilotons and 0.3 kilotons, and these explosions took place in a sand dune. The mode of detonation on each day was simultaneous. Holding yields small is to prevent any damage to buildings in local villages; the fissile material used was "completely indigenous". The tests provided "critical data for the validation of our capability in the design of nuclear weapons for different applications and delivery

systems....These tests have significantly enhanced our capability in computer simulation of new design and taken us to the stage of sub-critical experiments in future, if necessary.”

The first seismic station to record the shock waves was a site near Islamabad called Nihlore and recorded signal was around 250-500 times above background noise. An institute of Japanese reported the seismic waves set off by the blast in India were equivalent to those of earthquake with a magnitude of 4.9. The earthquake monitored by International Data Center and America Information Center for seismology was 5.0 Richter's Scale and 5.3 Richter scale, separately. The seismic data from Incorporated Research Institutions for Seismology (IRIS) and British Geological Survey showed a single event with a magnitude of 4.7, which equates to a yield of some 20 kilotons, with a uncertainty of two or so. US geological Survey broadcast more detailed and reliable data based on data from 125 stations, which placed the body-wave magnitude at 5.3, and the surface-wave magnitude of 3.6. These wave magnitudes suggested about 30-60 kilotons, which consisted with the total yield stated by Chidambaram of about 56 kilotons, if the blasts did take place in soft dune.

About May 13 tests, India said that the explosions took place in a “sand dune”; a fully contained explosion of the yields in soft, dry rock should have a magnitude of around 3.0, which can be detected by good-quality array stations. However, up to date, any stations gave no seismic magnitudes of these two small yield tests.

Pakistan's Nuclear Tests

In the five tests on May 28, three of the devices tested have yields in the sub-kiloton ranges and the remaining two larger explosions had yields of 25 and 12 kilotons; May 30 tests' explosion yield was 18 kilotons. All six tests were of fission devices and were conducted in remote Chayai area in the southwest province of Baluchistan. The first five test shafts of 800-835m deep with 2m diameter each bored into a rocky range and detonated simultaneously.

The Pakistan Atomic Energy Commission (PAEC) released a statement saying the five blasts measured 5.0 degree on the Richter scale and produced a yield of up to 40 kilotons of TNT. However, the Australia Geological Survey Organization said it had registered Pakistan's five nuclear tests, with one explosion of 5.0 magnitude; Research scientist David Jepson said in Canberren that the explosions had been registered at between 5 and 20 kilotons in southwest Pakistan. The U.S Geological Survey in Golden, Colo., said the strongest test had a preliminary magnitude of 4.9, compared to India's strongest blast, which registered 5.4. Jane's Defense Weekly reported, Pakistan's explosion on May 28 registered 4.6 on the Richter scale, indicating a yield of 7-8 kilotons; the sixth explosion on May is registered 4.3 on the scale, equivalent to 2-3 kilotons. Jane's Intelligence Review reported, the analysts insist that its first tests involved a maximum of three devices—not five as the government claimed and the cumulative force of the blast is most likely around 6 kilotons, and the second blast measured only 1.2 kilotons.

THE BACKGROUND OF NUCLEAR TESTS IN SOUTH ASIA AND ITS RELATION WITH CTBT

In spite of the complex background and their wide relations, the motive and goal of tests in south Asia are to some extent obvious, according to the variable attitude of the two countries, especially India, to CTBT.

Acting as means of Nuclear Nonproliferation, CTBT works to restrict nuclear tests and improving nuclear programs in two aspects. One of its significance is to restrict the five nuclear weapon countries (United States, Russia, British, France and China) in increasing their nuclear weapon stockpiles. Another is to impose restrictions on the NPT signatories and actual nuclear countries (India; Israel; Pakistani) in developing or improving their nuclear weapons.

Because of its extraordinary significance, CTBT has been become a long-term goal pursued by worldwide societies including India. India called for the ratification of stopping nuclear tests in 1954. After the cold war, the negotiation for CTBT reached an essential phase. India's original tests are zero-yield, which is admitted in the CTBT. India demanded to end any type of nuclear tests all over the world. "We now realize that, the entire nuclear disarmament is so complex that, even in the condition of no dealing with nuclear weapon disarmament, we still must fully make sure that the nuclear weapon countries will not use nuclear weapon or impose nuclear weapon threat to the no nuclear weapon countries". India's attitude to the effects of CTBT was that the important countries for successful signature of CTBT should be included in the CTBT at the first time of the birth of CTBT. CTBT going into effect should be based on the affirmation of a group of representative countries. This suggestion on CTBT coming into force evidently showed that India also was an important country for CTBT and India was expected to become a signatory of CTBT in 1994.

However, after the NPT enlarged meeting in May 1995, India's attitude was obviously changed. India's attitude became that, because the announced nuclear countries couldn't make obvious sure of nuclear disarmament during a certain period, so that nuclear disarmament must be certainly treated in CTBT. India also called for extending CTBT to ban the experimental and sub-critical tests. All of those done by India were to completely prevent the nuclear countries from increasing their nuclear weapon stockpiles and make the nuclear weapon dismissing more effective. It was in July 1996 when CTBT began to be signed that India related the nuclear disarmament with its country security again. India thought, because all of the five nuclear countries involved in CTBT didn't make a certain promise on dismissing their nuclear weapons, so "our country security naturally becomes the decisive factor of our policies, , Our neighboring countries is going on their nuclear weapon project, in this condition, if other countries still refuse to dismiss their nuclear weapons, India can't accept any term which may limit its country defence ability, , (CTBT) can't be thought of as a method for world-wide nuclear disarmament, it can't meet the requirement of India's country security. Therefore, the current type of CTBT can't be accepted by India".

Indian attitude to CTBT varied according to its nuclear policy. India began its nuclear program since sixties, but India government always maintained the policy named "nuclear option" which is also accounted as "have the ability to manufacture nuclear weapons, but don't have nuclear weapons". Since 1974 when India conducted its first test, it seemed that India would not make new nuclear tests again. But, after in Jan.

94, when CTBT negotiation paced its first step, India quitted the policy that India didn't make nuclear tests. On the contrary, it made very rapid progress in developing its nuclear plan. In order to realize its modernization of nuclear weapon stockpiles, India needed to miniaturize its warheads to make more suitable fitness for warheads into ballistic missiles and also needed to develop thermal nuclear devices to improve the destructive power of warheads. So, India needed a lot of data which could be acquired only in nuclear tests, especially in the condition that something showed that the yield and reliability of nuclear devices developed in 1974 had some uncertainty and that nuclear devices were low-yield fission devices rather than hydrogen bombs of fusion-enhanced nuclear weapons. Some American intelligence specialists thought that India was developing hydrogen bombs or "fusion-enhanced" atom bombs, this was confirmed by Doctor A.N.Prasad, the director of Bhabha Atom Research Center, who said, nuclear tests was important and also essential to examine theoretic models and improve (India's) nuclear devices. About in December 1995, the media in U.S showed the information that India was preparing a nuclear test. The U.S intelligence agencies using spy satellites picked up the preparations leading up to nuclear test at Pokharm in India where nuclear tests had been conducted in 1974. The preparations included checking up the underground shafts and examining the apparatus used for taking data from tests. In 1996, some of military officers thought India was preparing to conduct tests in 1997. In March 1998, Vajpaye government changed its "nuclear option" policy entirely. As a result, India conducted two-turn five tests in May 1998.

In addition, India hoped to have the prestige that comes with nuclear weapons and so have some room in great nuclear countries and permanent members of UN.

In fact, India's nuclear policy, including the attitude to CTBT and to nuclear tests, was also effected by its domestic politics. When the April-May country-wide vote gradually came in 1998, under the massive pressure of BJP making "nuclear option" weaponization, the current government had a more and more obstinate policy against CTBT and was about to conduct nuclear tests. Those were done to some extent to improve their domestic political trust and acquire the support of domestic political power including bureaucratic parties, Indian Press media and security analysts. All of Indian parties almost were against CTBT, as a result, it became very difficult for any party to give up this standpoint In election speech and later talks, BJP announced: the government supports the close relation between CTBT and detailed promise about disarmament. "BJP approves of no-nuclear world, but also refuses the concept of nuclear racial segregation. It's true that my government will make the decision of accepting nuclear weapons to enhance our country defence ability", said the head of BJP on April 20, 1996. Pramod Mahajam, the director of defence department of BJP government, who was in power only two weeks ago, also announced on May 20 that it's suggested in our party speech that nuclear option policy may be put into effect only if the defence ability was satisfied. Additional, a poll in Jan 1995 showed: sixty-two percent persons favored India with conducting tests to develop nuclear weapons. Fifty-four of that sixty-two percent of the people even thought that India should develop nuclear weapons though it might be suffered economic sanctions. Many years, political situation was always unstable in India, political power was often changed, therefore, a factor beyond domestic politic party and racial interest was eagerly needed for Indian government to integrate all of Indian power. One head of BJP foresaw that nuclear tests maybe end the separate situation in politics.

Overall, after the CTBT draft negotiation, the five announced nuclear countries and most of worldwide countries had signed CTBT, nuclear test ban and nuclear disarmament become fashionable. In this world situation and domestic political situation, Indian government couldn't continue its old nuclear policy and had to conduct nuclear tests.

Pakistan's attitude to CTBT seemed to be obvious and simple. Pakistan announced that Pakistan couldn't sign CTBT unless its area secure situation had been improved. In another word, Pakistan would sign CTBT only if India signed CTBT. Compared with India, the power of nuclear and conventional weapon in Pakistani was small, so there was a great pressure for Pakistani in competing for all military capacity with India. The former prime minister of Pakistan and other officers impressed again and again that Pakistan would have to conduct tests if India did conduct tests. Pakistan's reaction to Indian tests was very strong. Indian scientists thought Pakistan didn't have the defense ability offered by reliable nuclear weapons. India conducted Prithvi missile tests, and officers announced they would deploy those missiles soon, that induced much stronger insecure feelings in Pakistan.

Besides the concern with country security, domestic political pressure must force Pakistani government to make the decision of conducting tests. Reacting to Indian tests, military force--the greatest political power of Pakistan required nuclear tests. That was consistent with civil Person in Pakistan. A Poll in Pakistan on February 1996 showed that eighty- percent people approved of the coming of tests, if India had been done before.

Something indicated Pakistan had the preparation for nuclear tests for many years. Pakistan was equivalent to India in manufacturing and carrying nuclear weapons said Botto on Jan 18th, 1996. Furthermore, U.S intelligence specialists made a conclusion on May 5th, 1994, according to the satellite imagery, that Pakistan was preparing for its first nuclear test in, including checking up drafts dug many years ago. Though U.S officers didn't believe Pakistan would conduct test recently, the preparations for tests could complete in few days or few weeks if Islamabad made the decision to conduct nuclear tests. The fact that it was only sixteen days for Pakistani tests from Indian tests obviously suggested Pakistan had maker the preparation for tests before. Pakistan maybe develops and deploys its own missile to deal with Indian Prithvi missiles. Officer also emphasized that the missile deployment is equivalent to Indian Prithvi missile deployment.

The Indian tests on May 11 clearly induced great anger of Pakistan. G.A.Khan, Pakistani foreign minister said, Pakistan would quickly make equivalent action to Indian nuclear upgrade intention. In one upper house talking, he stated: "I make sure for our people that Pakistan fully have the ability to deal with every threat to our country security, Pakistan will exert proper means in its own sovereignty to assure its country security, Our country is developing through our own efforts, and every power and everything can't prevent. We will keep equivalent to India in all domains, We are now in the military race which is sharply upgraded in this area". Khan also affirmed, it was Indian impudent provocation and the peaceful reaction in world society that forced Pakistan to believe that Indian nuclear Non-proliferation. Pakistan

strongly denounced Indian tests and called for word-widely denouncing and punishing India, at the same time, Pakistan also rapidly did the preparations for tests. According to ABC-TV, there had some information that Pakistan was assembling technicians and mobiles at test base. Pakistan would be in trouble situation if world societies dolt with Indian tests using compulsory and unified punish and Indian government decided to stop tests and also agreed with CTBT. But two tests on May 13 were announced by India, this finally induced Pakistani tests. Prime minister Sharif said, "Because there is no effective efforts for world societies to deal with Indian tests, Pakistan has to conduct nuclear tests".

THE IMPACT OF SOUTH ASIA NUCLEAR TESTING ON THE CTBT

Whatever the motives and intentions of India and Pakistan to conduct their nuclear tests, the impact on the CTBT resulted from the testing event can't be undervalued.

The South Asia nuclear tests revealed or confirmed the technical flaws existing in the CTB Treaty

The prediction and monitoring for treaty violation

The test ban treaty allows evidence from national technical means to be utilized. The fact that the national technical means is only acquired by the U.S. and Russia and is not shared by other CTB signatories has limited its function in some sense. The national technical means had showed its limitation during the course of the South Asia nuclear tests prediction. The U.S. satellite monitoring did not detect test preparation by India, and failed to forecast the upcoming nuclear test by India. There are a number of possible responses to this issue.

One explanation said that most of the preparatory activity in the test site had been finished between 1995 and 1996, and the following activity in the test site is too short to be noticed by passing satellites; Another explanation said that unusually large missile test preparations in another part of "India had been used deliberately to lure satellite away from focusing on the nuclear test site, and there had been active military exercise around the test site, which confused the analysis of the satellite data. In addition, a report in the May 20 issue of Jane's Defense Weekly suggested that India used its own remote- sensing satellites to chart the paths of U.S. surveillance satellite and transferred its test-control center underground. In contrast, the U.S. surveillance satellite fairly well detected the preparatory activity in the Pakistan test site and the analysis gave more accurate prediction on the test. This indicates that the national technical means performed poorly in detecting the deliberately planned nuclear test. Though the verification mechanism of the CTBT is to detect possible nuclear test, not the preparatory activity, the evidence of the preparatory activity could provide better guide for other verification methods. In this sense, to make good use of the national technical means in the CTBT monitoring system, the technology sharing of the national technical means and the coordination of the satellites resources should be given more attention in the future CTBT negotiation.

The verification for low yield nuclear explosion and de-coupling nuclear test

India claimed that two sub-kiloton nuclear tests were conducted in May 13th, and their yields were 0.6 kiloton and 0.3 kiloton respectively. The International Data Center

(IDC), the American Seismological Information Center and other seismic stations didn't get any signal related to the May 13th event, nor did the Seismic Station at Nilore, Pakistan, which is 700 kilometers away from the test site. There have been various explanations for such phenomenon. One possibility was that the tests took place "in a sand dune." (The dunes in the area can reach 150 meters or more in height). A fully contained explosion in such kind a environments could lead to more absorption of seismic energy by the surrounding soft, dry sand environment, and magnitude of the quake decreased accordingly. Another assumption is that some de-coupling measure was used in the tests to avoid detection of the seismic signal by other states. People also suspected that the tests might have been smaller than advertised; if so, the lack of a seismic signal would not be a surprise. Finally, the lack of seismic signal could be the result of lack of IMS seismic stations in the territory of India and a better-configured seismic stations network around the region.

Similarly, Pakistan declared that it conducted a nuclear test with a yield of 18KT in May 30th. However the seismic station reported only a magnitude of 4.3, corresponding to an explosion of 2-3KT yield. According to Jane's Defense Week, June 10, 1998, this discrepancy may be linked to the fact that the test was carried out in a horizontal tunnel rather than a vertical shaft and that produced a lower seismic signal. From the facts described above, one can say that it is very likely that the low-yield test with the help of measures to reduce seismic signal, such as de-coupling, could circumvent the verification of seismic measuring method.

The Analysis of the seismic data

In addition to the problems mentioned above, the analysis result for the seismic data relevant to the test events could hardly be satisfying. Though much work had been done on the discrimination among natural earthquake, nuclear explosion and chemical explosion, the analysis for the seismic data from the May test events too often results in ambiguous conclusion. The most well-established identification criterion in the science community, the "mb: Ms" method, compares the magnitude of seismic body waves to that of seismic surface waves to determine if the seismic wave is caused by nuclear explosion or chemical explosion or natural earthquake. The greater the ratio, the more likely it could be a nuclear test. The U.S. Geological Survey values (mb: 5.2; Ms 3.6) for the Indian May 11th nuclear test, when compared to data sets of western U.S. explosions and earthquakes, would have identified it as an explosion - but with only 50-90 percent confidence. Here, it is interesting to mention an earthquake event around the Island of Novaya Zemlya of Russia in August 16th, 1996. At that day, 6 IMS seismic stations and some other local seismic stations near the Island of Novaya Zemlya, detected a seismic wave with a magnitude of 3.3- 3.8. Some U.S. intelligence officials and the U.S. Defense Department initially were highly confident that the seismic signal indicates a nuclear test with a yield of 100 1000 TNT tons. The reasons are that the quake took lace in Island of Novaya Zemlya and the seismic signal possesses the characteristic of nuclear explosion. 3 months later, it appeared that the accusation was wrong and the Central Intelligence Agency declared that the August 16th earthquake event was a natural earthquake that took place deep in the Kara Sea 130 km away from Island of Novaya Zemlya. From what is described above, it is not hard to get an impression: the seismic monitoring system of CTBT could not get satisfying result when it is to detect low-yield explosion. With regard to the low-yield explosion conducted in May by India and Pakistan respectively, people have reasons to

worry that the CTBT seismic monitoring system may not detect and identify any illegal low-yield nuclear tests when the CTBT certification system is formally started.

The measuring and monitoring of radio-nuclide

In addition to the seismic stations, the CTBT monitoring system includes hydro-acoustic stations, infrasound stations and radio-nuclide measuring stations. However, only radio-nuclide measuring is relevant to this South Asia nuclear test monitoring. All the radio-nuclide measuring stations could detect radioactive particles, and 40 of which could detect the noble gas byproduct which is released into the atmosphere from an underground nuclear test, such as argon 37, Xenon133 and Krypton 85. So far, only 20 of the planned stations are in action. Generally, noble gas and radioactive particles would be released into the atmosphere several days after the underground test, and the release could last for months. However, as of late May, it looked as if none of the stations, including the nearest radionuclide monitoring station in Kuwait, had not picked up traces. This indicates that the radio-nuclide measuring method has its limit in detecting nuclear test-- the station could not detect the nuclear test that takes place far away from the radio-nuclide measuring station.

Laboratory experiment and other disputed test method

The current CTB Treaty forbids field nuclear test, while allows non-nuclear test, such as sub-critical test and hydrodynamic experiments, and some other laboratory experiments. During the process of negotiating CTBT, many nations held different kinds of attitudes toward the so-called “zero yield” concept, and they can't reach agreement on whether to put the hydrodynamic or sub-critical tests into the forbidden list. The problem here is that such kind of test can't be verified or detected in the current technical condition. India initially held that CTBT should forbid all kinds of tests related to nuclear weapon, including sub-critical test and hydrodynamic test. It is interesting to note that Mr. Raja Pamana, the former head of the India Bhabha Atomic Research center, said that the May 13th test was actually a sub-critical test; The science adviser for India Defense Minister announced that India had the capability to conduct “sub-critical test”. The U.S. maintains that such kind of test is to keep the reliability of its nuclear stockpile and understand aging related failure problems, not to develop new nuclear weapons or to improve the existing nuclear weapons. Many other nations doubt such kind of explanation. Some India officials claimed that low-yield nuclear test and sub-critical test could provide sufficient data to improve the computer model design.

The NIF of the U.S. SBSS program and the French LMJ facility are not in the forbidden list in the CTBT. People become more and more concerned that such kind of facility may result in the birth of pure fusion weapon (without fission trigger), and present greater challenge to the world non-proliferation movement.

The South Asia nuclear test also uncovers the political flaws in the CTBT.

Ever since the CTB Treaty was open for public signature in September 1996, it has actually been in effect according to international traditions and one UN Agreement on International treaties—all signatory nations should stop any nuclear activity prohibited by CTBT since September 1996. The U.S. even passed the Nuclear Proliferation Prevention Act of 1994, and threatened to pose sanction on any nations

which would conduct their nuclear tests. Even so, India and Pakistan conducted nuclear test respectively, which caused damage to the world nuclear non-proliferation movement. This indicates that the existing CTBT system can't substantially hold back any potential violators and prevent them from conducting test even in the face of some sanctions. This is reflected in the South Asia test event. India had long had the desire to enter the nuclear club, and its many attempts to conduct nuclear tests have been dissuaded by the U.S. and other western powers. Before its May nuclear tests, the India Government had fully considered the sanction and the damage it may resulted after the nuclear tests, and concluded that India had the capability to counteract all the bad effect from the sanction. After the May 11th and May 13th nuclear tests by India, the U.S. declared that it would pose sanction on India according to its domestic law. The sanctions include denial of U.S. credits and credit guarantees, suspension of some defense and high technology export and military aid. Washington also opposite India loan requests to international lending institutions. Other western nations, such as Canada, Germany and Japan, followed suit, also suspend their aid to India. However, their sanctions can do little harm to India, the second largest populated nations in the world. In a sense, these weak sanctions served as a blasting fuse for the following Pakistan nuclear test. Pakistan had blamed the western powers for their weak altitude toward India when India conducted its nuclear test, and avows to take any necessary steps to protect its own national security.

For lack of consensus in the altitudes toward India 's nuclear testing in the world (For example, Russia and France are reluctant to penalize India for its wrongdoing), Pakistan was aroused more or less to conduct its nuclear tests. It is fairly concerned that other potential nuclear-capable nations may follow suit and develop their own nuclear weapon project despite sanction and penalty. If so, the NPT and the CTBT could then become a pile of wastepaper.

The consequence of the South Asia nuclear test and its effect on the CTBT

Though the earthquake resulted from the nuclear test only lasted several minutes, the effect it may bring to international nuclear non-proliferation system would stay for years. The South Asia nuclear test, especially the Indian nuclear test, had set a very dangerous example. India attempted to obtain the status of member of the nuclear club by abruptly and rudely conduct its nuclear tests. If the international community keeps on denying its nuclear nation status, India would insist to stay outside the NPT and the CTBT; If India is acknowledged as one of the legal nuclear nations, the definition of nuclear nation in NPT should be modified. Thus, it would set a very bad model for other nuclear threshold countries to encourage other nuclear-potential nations to follow up what India had done and develop nuclear weapons and conduct nuclear tests, and eventually result in the invalidation of NPT and CTBT.

Though India said that it would accept some provisions in the CTBT after its nuclear test in May. The problem of what status that India should assume to join CTBT and NPT can be very disturbing. There exists a consensus among the international community that India should join CTBT, which is an important measure to hold back its nuclear weapon development program. The key issue here is that India should pay price for what it had done, or the existing nuclear non-proliferation system can't be maintained. In the wake of the South Asia nuclear test, the international community

strongly demanded that India and Pakistan should stop their nuclear test immediately, abandon their nuclear weapon development projects and unconditionally join the CTBT and the NPT. The U.S. had held several negotiations with India and Pakistan respectively, and it resulted in no substantial progress.

India in some cases said that it could maintain a nuclear deterrent force without further nuclear tests, and it would consider accept the CTBT. However, India always thought that the CTBT was discriminatory and claimed that it would never sign the Treaty unless the Treaty is modified. After he met the Prim Minister Vajpayee, the Defense Minister Fernandes said that India would sign the CTBT only when all the discriminatory clauses in the Treaty are deleted.

The South Asia nuclear tests may also trigger regional arms race, especially the arms race in the South Asia region. Both India and Pakistan are ambitiously involved in their own ballistic missile programs. The “Gauri” missile, which could reach up to 1500 km, was successfully test fired in June 4th this year and gave Pakistan the capability to strike inside of the Indian territory for the first time. At the same time India was busy developing its “Agni” missile which has a range of 2500 km and a payload of 1 meter ton. It is said that the “Agni” upgrade could extent its range to 4000 km. This upgrade is obviously out-designed its goal against Pakistan. In addition, both subcontinental belligerents can manufacture weapons-grade plutonium and uranium, essential ingredients for nuclear weapons. India has an estimated stockpile of about 370 kilograms of weapon-grade plutonium, enough to make roughly 75 nuclear weapons; Pakistan has amassed some 210 kilograms of weapon-grade uranium, enough for roughly 10 nuclear weapons. India’s nuclear arsenal is estimated seven times larger than Pakistan’s, but Pakistan could reduce the gap by taking some measures-- the weapon-grade uranium is easier to produce than the weapon-grade plutonium. Therefore, both nations would be forced to increase their fissile material production and led to an arms race, and eventually threaten the future “Cutoff Treaty”.

SUMMARY

This paper presents the process and background of the South Asia nuclear tests, as well as its relation with the CTB Treaty. Our analysis indicates: the South Asia nuclear tests had uncovered or confirmed some technical flaws existing in the current CTBT, including the aspects of the “National Technical Means”, seismic monitoring, radio-nuclide measuring and the IMS analysis system. We found that the current IMS monitoring system can’t detect or monitor efficiently very-low yield nuclear tests and some other non-nuclear tests for nuclear weapon development, such as sub-critical test and computer modeling experiment. These kinds of test could limit the function of the CTBT to forbid the development and improvement of nuclear weapons. The South Asia nuclear test also uncovered some political flaws of the CTBT, which was much influenced by the current complex international relations. In general, the South Asia nuclear tests act as a setback for the nuclear non-proliferation mechanism and the comprehensive test ban treaty, therefore constituted a great shock to the CTBT. The South Asia nuclear tests may trigger new wave of arms race, especially in the South Asia region. At the same time, the tests also prompted the international community to give more attention to the CTBT. Our analysis shows that it is very necessary to study further and develop CTBT- related monitoring and verification technology, and

increase the level of punishment or sanction on any Treaty violator, to avoid the nullification of the CTBT.