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Implications of a Comprehensive Test Ban for China's Security Policy

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Abstract

This paper focuses on the impact of a comprehensive test ban on China's nuclear program and security policy. After a general review of China's nuclear doctrine and development, the study analyzes the relationship between China's nuclear strategy and its desire for testing, and explores the reasons China decided to join the Comprehensive Test Ban Treaty. By comparing the maturity of the nuclear programs of the nuclear states and the degree of their preparations for a cessation of nuclear tests, this paper concludes that a comprehensive test ban would place greater constraints on China's nuclear program than on those of the others. Efforts such as a deeper reduction of the nuclear arsenals of the principal nuclear powers, a no-first-use commitment by all nuclear states, and the adherence to the ABM treaty by its signatories would be critical to reducing China's concerns. The progress of international arms control negotiations in the above directions would further encourage China to make even greater contributions in the field of global arms control in the post–comprehensive test ban era.

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Introduction

More than two thousand nuclear weapons tests have been conducted in the world since the Americans carried out the first test in New Mexico on July 16, 1945. Beginning in 1954 with a worldwide political and scientific protest over atmospheric nuclear tests and the Indian proposal for a "standstill agreement" on testing, efforts to ban nuclear testing have had a long history.[1] Now a comprehensive nuclear test ban (CTB) has at last become an attainable goal because of the progress of international negotiations toward a Comprehensive Nuclear Test Ban Treaty (CTBT) that began in Geneva in 1994. Given that a CTB would be the first treaty to require the five nuclear-weapon states to restrain their nuclear weapons programs, it would be a significant development in arms control if the CTBT enters into force in the coming years as expected by its signatories.

The impact of a CTB on the nuclear weapons programs of each of the nuclear-weapon states will vary according to a number of factors, including their nuclear doctrines, the maturity of their nuclear weapon programs, and the degree of their preparations for a cessation of nuclear tests. Compared with other nuclear-weapon states, a CTB would place greater constraints on China's nuclear weapons program.

To understand what impact a CTB would have on China's nuclear weapons program and its security policy, let us first examine China's nuclear strategy.

The views expressed in this paper are the author's and do not necessarily reflect those of the Institute of Applied Physics and Computational Mathematics.

China's Nuclear Strategy

As is known, in the 1950s the United States considered using nuclear weapons against China several times.[2] Faced repeatedly with direct nuclear threats from the United States, Mao Zedong and other Chinese leaders made a decision in January 1955 to develop nuclear weapons for the purpose of opposing the U.S. policy of nuclear blackmail and nuclear threat against China and breaking the U.S. nuclear monopoly. As Mao Zedong commented in April 1956, "If we are not to be bullied in this world, we cannot do without the bomb."[3] Furthermore, having drawn a lesson from the nuclear confrontation between the United States and the Soviet Union, China recognized the leverage of nuclear weapons in the field of politics and diplomacy. Developing nuclear weapons was aimed also at creating a basis for global nuclear disarmament.[4]

The primary nature of China's nuclear strategy has been defensive in outlook, relying on a strategy of limited retaliation. As was pointed out in the government statement issued on October 16, 1964, the day of China's first nuclear test, "at no time and under no circumstances would China be the first to use nuclear weapons." A no-first-use policy reflects the defensive nature of China's nuclear strategy and has become state policy. China decided to build nuclear weapons as a retaliatory force to prevent others from initiating a first strike against it. "Limited retaliation" is reflected in China's small number of nuclear weapons. China's nuclear development policy is determined by the defensive nature of its nuclear strategy and is based on its economic situation as well as the perception that a small number of nuclear warheads could inflict psychologically unacceptable damage on any possible nuclear attacker. As Mao Zedong put it, "A few atomic bombs are enough." And, "In any case, we won't build more atomic bombs and missiles than others."[5]

Under instructions to pursue a limited nuclear retaliatory capability, and in response to the growing nuclear strike capabilities of other states, the vital requirements for China's nuclear forces are to survive a first strike and possess a second-strike capability. China's nuclear acquisition and deployment efforts, some of which are under development, have reflected these requirements:[6]

- Develop a nuclear triad including ICBM and SSBN (see Table 1);
- Minimize the vulnerability of the nuclear arsenal by hardening underground silos, storing missiles in tunnels or caves, and camouflaging deployment sites;[7]
- Enhance the penetrability and quick-reaction capabilities of strategic missiles;[8]
- Develop new types of mobile and solid-propellant missiles.

Over the past thirty years, China has pursued a path to improve its nuclear weapon technology gradually in order to ensure a second retaliatory capability. Possessing limited and credible retaliatory forces has firmly remained the core of China's nuclear policy. Deng Xiaoping's speech in 1983 also reflected this point: Beijing's nuclear arms "had forced the superpowers not to use" nuclear weapons against China, and "China only wants to adhere to this principle: we must have what others have, and anyone who wants to destroy us will be subject to retaliation."[9]

Table 1. Chinese Nuclear Forces

Delivery vehicle	Year deployed	Range (km)/Payload (kg)	Comments
Aircraft			
H-6	1965	3,100/4,500	
Land-based missiles			
DF-3A	1971	2,800/2,150	liquid
DF-4	1980	4,750/2,200	liquid
DF-5A	1981	13,000/3,200	liquid
DF-21	1986	1,800/600	solid
DF-31	late 1990s	8,000/700	solid
DF-41	?	12,000/800?	
Submarine-based missiles			
JL-1	1988	1,700/600	solid
JL-2	late 1990s	8,000/700	solid

Sources: *Arms Control Today*, December 1993, p. 29. Xie Guang, *China Today: Scientific and Technological Undertakings of National Defense*, Vol. 1, pp. 188, 340; Vol. 2, p. 20

The Role of Nuclear Testing

Generally speaking, first-generation nuclear warheads may not require testing, at least for simple fission bombs using U-235 (e.g., the one exploded over Hiroshima). Tests for the following purposes, however, are either necessary or highly desirable:

1. New weapon designs

For development of so-called "third-generation" nuclear weapons which have special weapon effects for given military missions such as nuclear directed-energy weapons, enhanced-radiation weapons, etc.

For modernization of the first two generations of nuclear weapons—the fission and fusion explosive devices, optimize yield-to-weight and yield-to-volume designs to make the weapon assembly compatible with the delivery vehicle.

2. Nuclear weapons effects

To check the effects of an explosion on military equipment.

3. Reliability of stockpiled weapons

To confirm that weapons that have been deployed or stockpiled continue to be effective.

4. Safety tests

To improve the safety of warheads that could not appropriately be calculated or tested in other ways. Safety devices on nuclear weapons are intended to prevent inadvertent or accidental explosions. In the United States, safety measures such as Enhanced Nuclear

Detonation Safety (ENDS), Insensitive High Explosive (IHE), a Fire-Resistant Pit (FRP), and a One-Point-Safe Design are currently employed.

5. Retention of a technology base

To retain a core of experienced weapon designers, which is indispensable for maintaining self-confidence in the nation's nuclear forces.[10]

It is evident that a stop to nuclear testing would halt or at least slow the development of essentially new nuclear weapons.

Among the 2,045 nuclear weapon tests carried out worldwide, the United State carried out 1,030 tests, the Soviet Union 715, France 210, Britain 45, and China 45.[11] (See Figure 1 and Table 2.)

Figure 1. Total Number of Nuclear Weapons Tests, 1945–1996

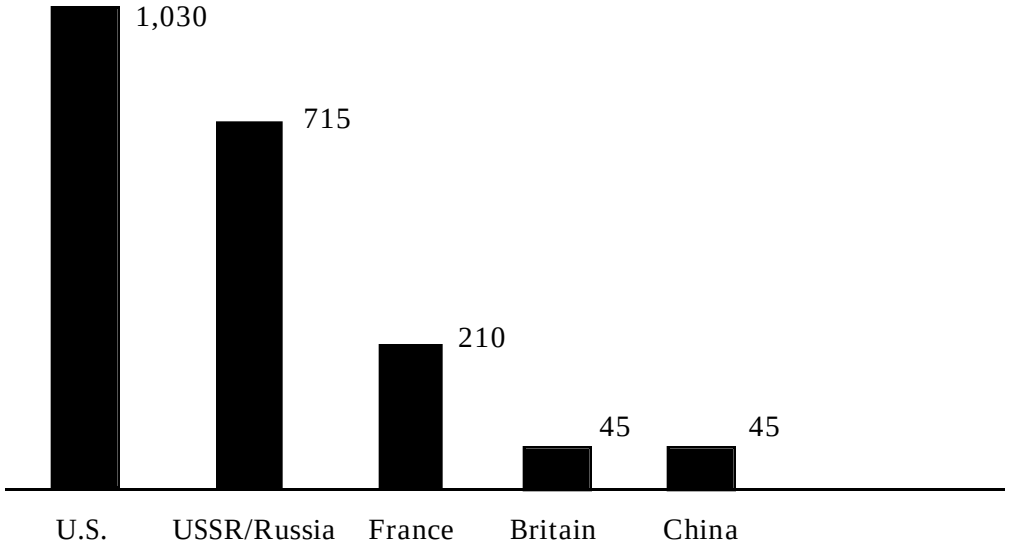

Table 2. Chinese Nuclear Tests Record, 1964–1996

#	Date	Yield	Type	#	Date	Yield	Type
1	10-16-64	22kt	A	24	10-14-78	<20kt	U
2	05-14-65	35kt	A	25	12-14-78	<20kt	A
3	05-09-66	250kt	A	26	09-13-79	?	A
4	10-27-66	12kt	A	27	10-16-80	200kt–1mt	A
5	12-28-66	122kt	A	28	10-05-82	3–15kt	U
6	6-17-67	3.3mt	A	29	05-04-83	?	U
7	12-24-67	15–25kt	A	30	10-06-83	20–100kt	U
8	12-27-68	3mt	A	31	10-03-84	15–70kt	U
9	09-23-69	20kt	U	32	12-19-84	5–50kt	U
10	09-29-69	3mt	U	33	06-05-87	250kt^	U
11	10-14-70	3.4mt	A	34	09-29-88	1–20kt	U
12	11-18-71	15k	A	35	05-26-90	50–200kt	U
13	01-07-72	8kt	A	36	05-26-90	50–200kt	U
14	03-18-72	170kt	A	37	05-21-92	660kt	U
15	06-27-73	2–3mt	A	38	09-25-92	1–20kt	U
16	06-17-74	200kt–1mt	A	39	10-05-93	40–80kt	U
17	10-27-75	<10kt	U	40	06-10-94	10–60kt*	U
18	01-23-76	<20kt	A	41	10-07-94	40–150kt+	U
19	09-26-76	200kt	A	42	05-15-95	95kt**	U
20	10-17-76	10–20kt	U	43	08-17-95	60–80kt++	U
21	11-17-76	4mt	A	44	06-08-96	20–80kt'	U
22	09-17-77	<20kt	A	45	07-29-96	1–5kt''	U
23	03-15-78	6–20kt	A				

Abbreviations: A: atmosphere, U: underground.

Sources: *Nuclear Weapons Databook*, Vol. V, pp. 420–421.
* *The Nonproliferation Review*, Winter 1995, p. 93.
** *The Nonproliferation Review*, Fall 1995, p. 118.
+ *Arms Control Today*, November 1994, p. 33.
++ *The Arms Control Reporter*, 1995, 608.B.353.
'*Arms Control Today*, May/June 1996, p. 30.
'' Seth Faison, "China Sets Off Nuclear Test, Then Announces Moratorium," *The New York Times*, July 30, 1996, A3.
^ Vipin Gupta, "Locating Nuclear Explosions at the Chinese Test Site Near Lop Nor," *Science & Global Security* 5 (1995), 208.

Preparedness of the Nuclear Weapon States for a CTB

The United States is better prepared than other states to maintain its nuclear forces under a no-test regime.

During the Cold War, a CTB was a long-term objective of the United States.[12] In the test ban debate there were a number of arguments against a CTB, such as the requirements for developing new types of warheads, improving warhead safety, and maintaining the reliability of weapons.

In the past half-century, the United States has developed eighty-five types of nuclear warheads for more than one hundred kinds of weapon systems.[13] With the end of the Cold War, a broad consensus has developed in both America and Russia that existing types of nuclear weapons already provide the basis for more than adequate deterrence.[14] Therefore, the argument against a CTB for developing new types of warheads lost its justification. The Bush administration announced a policy in September 1992 stating that the United States had no plans for any new type of warhead.

The U.S. enduring stockpile under START II contains seven types of warheads, all of which are one-point-safe and possess modern safety features (see Table 3).[15]

Table 3. U.S. Nuclear Weapons after START II (2003)

Warhead	Weapons system	Stockpile entry date	Safety features
B61	Strategic and tactical bombs	1980–present	ENDS, IHE
W88	Trident II	1990	ENDS
W87	Minuteman III	1986	ENDS, IHE, FRP
W80	ALCM, SLCM	1982, 1984	ENDS, IHE
B83	Strategic bomb	1983	ENDS, IHE, FRP
W78	Minuteman III	1980	ENDS
W76	Trident II	1979	ENDS

ALCM: Air-launched cruise missile; SLCM: Submarine-launched cruise missile

Sources: Tom A. Zamora, "Put a Safety Cap on Testing," *The Bulletin of the Atomic Scientists*, March 1992, p. 27; NRDC Nuclear Notebook, *The Bulletin of the Atomic Scientists*, July/August 1995, p. 77.

Although the warheads of W88, W76, and W78, respectively, for Trident II and Minuteman III have no IHE feature, "the Air Force and Navy, in cooperation with the Office of the Secretary of Defense and the Department of Energy, have evaluated the safety of these ballistic missiles and determined: that there is not now sufficient evidence to warrant our changing either warheads or propellants."[16] Thus, no tests would be needed to upgrade the safety of the stockpile.

As far as reliability is concerned, Ray E. Kidder, a senior physicist at Lawrence Livermore National Laboratory, concluded, after "a thorough and comprehensive review of the U.S. nuclear weapons test record," that "a high degree of confidence in the reliability of the existing stockpile is justified, and that it is sufficiently robust to permit confidence in the

reliability of the remanufactured warheads in the absence of nuclear explosive tests."[17] A similar conclusion was reached in the JASON's report of August 1995: "The United States can, today, have high confidence in the safety, reliability, and performance margins of the nuclear weapons that are designated to remain in the enduring stockpile."[18]

In order to preserve the stockpile in the absence of nuclear testing, the United States has started an extensive science-based Stockpile Stewardship and Management Program (SSMP) with budget support in the billions to include many experimental facilities.[19]

The primary goals of the SSMP program are to provide:

- High confidence in the safety, security, and reliability of the U.S. stockpile to ensure the effectiveness of the U.S. nuclear deterrent.
- A small, affordable, and effective remanufacturing complex.
- The ability to reconstitute U.S. nuclear testing and weapon production capabilities, should national security so demand in the future.[20]

The facilities included in the SSMP program are broken into four functional categories:

Hydrodynamic tests
: These experiments are used to measure the ability of a warhead's high explosives to compress the fissile material core. The test results are then compared with computer predictions and used to improve computer models.

Hydronuclear tests
: These experiments are used to assess nuclear weapon safety and reliability. If hydronuclear tests produce a small fission yield, they would be prohibited under the "zero yield" test ban policy.

High-energy-density tests
: By simulating the conditions found in a thermonuclear explosion through small-scale tests, these tests provide more accurate information on the physics of matter at high energy density, thereby providing information relevant to secondary stage design.

Weapons effects tests
: These tests simulate the effects of nuclear explosions on nuclear weapons and military hardware.[21]

In October 1995, the U.S. DoE announced plans to conduct a series of underground "subcritical experiments" at the Nevada Test Site in 1996 and beyond to improve knowledge of the dynamic properties of aged nuclear materials to better maintain the arsenal as it ages.[22] The tests would involve high explosives and fissile material but would not achieve a self-sustaining chain reaction. The first experiment has been postponed to avoid the creation of a major controversy at the test ban talks in Geneva.[23]

There are criticisms of the U.S. program of laboratory experiments short of nuclear explosions, as it is suspected to be able to provide research on new types of weapons and would erode the technological barrier a CTBT might impose.[24] Despite these criticisms, the United States plans to continue its SSMP program within the constraints imposed by the CTBT.

With these efforts, the United States is believed to have high confidence in its enduring stockpile without nuclear testing. Under these circumstances, it is not hard to understand why the United States pushed for the signing of the CTBT as quickly as possible.

With respect to France, it planned in 1991 to invest ten billion francs ($2 billion) over five years in the PALEN (Preparation for Limitations on Nuclear Testing) project to "verify the quality and safety of the weapons in service, and to replace and further develop warheads for the deterrence force without the kind of nuclear testing that would release significant amounts of energy." This is viewed as a means to develop more robust weapons and the simulation capabilities for these weapons. The funds of the PALEN project have been allocated to equipment used in laboratory experiments, including orders for high-powered computers, lasers, accelerators, and radiographic instruments.[25] Combined with the six tests conducted during September 1995 and January 1996, France "will have an efficient and modern defense system which will last."[26] In addition, France is reported to have received U.S. assistance for decades concerning nuclear weapon safety and security. In 1994, the United States and France agreed to cooperate according to a secret agreement under which the two nations would share information relating to stockpile stewardship.[27] And this kind of cooperation will continue according to an agreement signed by the two countries in June 1996.

Britain has long enjoyed a broad range of technology sharing with the United States, including data on weapons performance as well as on safety and reliability issues.[28] The British stockpile could continue to rely on that even after the CTB.

Russia, with a rich bank of test data after 715 tests, has developed more than seventy-five types of nuclear weapons and produced tens of thousands of warheads since 1949. Like the United States, Russia's nuclear weapon technology has also arrived at a peak and it has no urgent need to design new warheads. For Russia, a CTB would have little effect on its nuclear deterrence capability. In fact, it has exercised a moratorium on nuclear testing since 1991. Limited by its political and economic situation, Russia could not implement an expensive stockpile stewardship program after a CTB. However, with rich data and experiences from many safety tests, Russia would have fewer worries about the safety or reliability of its stockpile.

This is not the case, however, for China. China is not technically ready for a CTB. As mentioned earlier, efforts to improve its nuclear weapons technology to ensure its limited nuclear retaliatory capability are in progress, and it is not surprising that China desires some more tests for technical improvement in nuclear weapons.

First, the rapid development in the 1970s of advanced military technologies and first nuclear strike capability by the nuclear powers has challenged the survivability of China's strategic forces. By the mid-1980s, China had developed a DF series of land-based liquid-propellant ballistic missiles. These first-generation missiles have many weaknesses, including slow response, vulnerable basing vis-à-vis a surprise counterforce attack, large radar cross-sections, and poor accuracy.[29] Therefore, in subsequent years China made many efforts to overcome these weaknesses. As the most important effort, China began in the mid-1980s a process of shifting its delivery systems from fixed-based to mobile and from liquid-propellant to solid-propellant. High survivability is the major advantage of the new generation of missiles. Since the throw weight of solid missiles is less than that of liquid-fueled missiles, they need new types of warheads that are miniaturized and have better yield-to-weight ratios.[30] The efforts to develop new warhead designs for mobile and solid missiles have surely included a new run of nuclear tests.

Second, with respect to the desirability of maintaining the safety of the nuclear arsenal, of the more than one thousand tests carried out by the United States, about 140 low-yield tests are believed to have been conducted for safety evaluation; of the 715 tests by the former

Soviet Union, around thirty to forty were safety tests.[31] France also has conducted twelve safety tests.[32] Given the very small number of tests China has apparently conducted, it is understandable that China might wish to do more in this regard, though not all introductions of safety measures require tests.

China has paid attention to the safety and reliability of nuclear warheads and has conducted studies in this regard, such as warhead safety under the circumstances of fires, falling, or collision.[33] There is no indication, however, that China possesses modern safety measures in its stockpile. In the long run, incorporating some modern safety measures into future designs is necessary for China's stockpile.[34]

Third, the rapid development and likely deployment of advanced BMD systems by other countries would degrade China's limited retaliatory capability. To neutralize the impact on China's nuclear retaliatory capability of deployment of advanced BMD systems by its potential adversaries, a desirable option for China would probably be improving the penetrability of its strike forces by means of developing MRVs (multiple reentry vehicles) and even MIRVs (multiple independently targeted reentry vehicles). Considering the fact that the other four nuclear states all possess MIRVed missiles, China is likely to adopt a similar option. If so, nuclear tests may be needed to develop miniaturized warheads.

According to Robert Norris's estimate in *Nuclear Weapon Databook V*, China had developed six types of warheads by 1992, after thirty-nine tests with a traditional pace of one to two tests per year (see Table 4). Thus, an average of six to seven tests seems to be required to finalize a specific design. So it would have been hard for China to complete all the missions mentioned above with the very limited number of tests it conducted in recent years. It is obvious that the CTBT would impose substantive constraints on China's efforts to develop and improve nuclear warheads.

It is natural to ask, then, whether it is feasible for China to initiate a program like the U.S. SSMP or the French PALEN. In fact, it would be difficult for China to have an SSMP-like project for both financial and technical reasons. During the 1960s and 1970s, with the perceived dual threat from American and Soviet aggression, the nation "concentrated human, material, and financial resources" to develop nuclear weapons; all civilian projects and less critical defense programs gave way to the strategic weapons programs.[35] Since the late 1970s, however, China has been carrying out a policy of reform and openness to the external world, and established economic development as its national strategy. Recognizing that the probability of global war has decreased and the likelihood of regional conflict increased, Beijing has also adjusted its security strategy: it has switched from preparations for the outbreak of an early war, a full-scale war, and a nuclear war to preparations for the outbreak of conventional conflicts around its periphery.[36] Since then, the proportion of the country's defense spending to its gross domestic product (GDP) has declined from 4.68 percent in 1978 to 1.26 percent in 1994, and part of its nuclear industry has been demilitarized.[37] Furthermore, the Chinese government declared in November 1995 that "China will not increase its defense spending substantially or by a large margin," as long as there is no serious threat to its national security.[38] It seems that the nuclear weapons establishment would not be likely to have the budget to support an extensive stockpile stewardship program after signing the CTBT.

On the technical side, the Chinese nuclear program cannot have much data and experience, given the comparatively small number of nuclear tests China has conducted. Like other nuclear states, China's arsenal will face similar safety and reliability problems under a CTB. Under the constraints of a limited budget and limited technical data and experience, what

China can probably do is to retain a relatively small technical competency base to ensure the safety and reliability of its existing arsenal by means other than nuclear testing. Consequently, without an extensive SSMP-like program, China would be at more of a disadvantage in a post-CTB era. A CTB would seem to not only freeze the gap between China and other nuclear states, but very likely enlarge this gap also.

Table 4. Chinese Nuclear Tests, 1964–1996

Year	Total	Year	Total	Year	Total
1964	1	1975	1	1986	0
1965	1	1976	4	1987	1
1966	3	1977	1	1988	1
1967	2	1978	3	1989	0
1968	1	1979	1	1990	2
1969	2	1980	1	1991	0
1970	1	1981	0	1992	2
1971	1	1982	1	1993	1
1972	2	1983	2	1994	2
1973	1	1984	2	1995	2
1974	1	1985	0	1996	2

Source: *The Bulletin of the Atomic Scientists*, May/June 1996, p. 62.

China's Decision on the CTBT

That all steps toward nuclear disarmament should be considered within the framework of "complete prohibition and thorough destruction of nuclear weapons" has remained China's long-standing position on nuclear arms control. To this ultimate goal, a fundamental objective is to eliminate or reduce the risk of a nuclear war or the use of nuclear weapons in military conflicts. The no-first-use pledge or further no-use agreement, the Chinese hold, is much more significant than any other step. Thus, the Chinese view of the appropriate order for nuclear disarmament has been:

1. In order to reduce the importance of nuclear weapons, no-first-use or further no-use declarations should be issued.

2. The United States and Russia shall be the first to stop nuclear testing and take substantial measures to drastically reduce their nuclear weapons, both active and stored;

3. Other steps, including a CTBT and cutoff treaty on production of nuclear materials for weapons use, should be taken.

From this point of view, the CTBT alone, without other major steps, could neither reduce the dangerous use of nuclear weapons nor prevent the proliferation of first-generation nuclear weapons. A CTBT is an important step, but not the most urgent. Moreover, those nuclear-weapon states that have developed sufficient types and overwhelming numbers of nuclear weapons do not have an urgent need to upgrade their warheads. So the CTB

would have little influence on their nuclear deterrents. Thus, the CTB would have unequal constraints on the nuclear programs of the five nuclear-weapon states.

Although many Chinese experts have reservations about the CTBT, the Chinese government expressed its willingness in September 1993 to participate in the negotiations for the CTBT, and committed in a statement on October 5, 1993 to sign the treaty no later than 1996. In fact, China has called many times on all the nuclear weapon states to "immediately start negotiations to conclude a treaty on no-first-use of nuclear weapons against each other." However, the CTBT negotiations advanced to the final stage without any commitment on the negotiation of the no-first-use issue. China, together with other nuclear states, signed the CTBT on 24 September 1996. The rationale of China's position can be summarized as the following:

1. Promote the NPT regime.
Numerous non-nuclear states have long appealed to conclude a CTBT, and they view a CTB as an essential step of disarmament and critical to stopping the nuclear arms race.[39] Indeed, concluding a CTBT as soon as possible has become a condition for maintaining an indefinitely effective NPT regime.[40] The signing of the CTBT by the five nuclear states would not only demonstrate their good faith in Article VI of the NPT, but also show their willingness to forgo an essential means to develop nuclear weapons. Though technically a CTB can only play a limited role in preventing nuclear proliferation, the CTBT gives important symbolic significance to the NPT regime, which is beneficial to all countries including China.

2. Create favorable conditions for economic development.
China needs a peaceful environment in order to be able to devote itself completely to its economic development. Signing the CTBT, which has direct constraints on its nuclear program, demonstrates China's active support for nuclear arms control and good willingness to promote international security, which will win China more international respect. Under a favorable international environment, China could develop its economy more smoothly.

3. Spur further disarmament.
A compromise in this regard would spur further reductions in the strategic weapons of the principal nuclear-weapon states. China's decision to join the CTBT "is not only a response to the appeal of the vast number of non-nuclear weapon states, but also a concrete action to promote nuclear disarmament."[41] China could play a more constructive role and take initiatives in future arms-control negotiations.

Comparing the attitude China has taken toward the CTBT with that it took to the Partial Test Ban Treaty in the 1960s, one can see that the end of the Cold War and the Chinese government's Open Door policy spurred China to participate in the test ban talks. The nuclear threats from the United States and Russia have been greatly reduced since the end of the Cold War. In a more open post–Cold War era, China could pursue the improvement of its security environment, to some extent, through participating more actively in international arms control rather than by only developing its defensive force.

Accordingly, despite the disadvantageous aspects of the CTBT for China, participating in the CTBT regime would also be in China's long-term political and security interests.

Options and Questions

With the CTBT, China cannot modernize its nuclear warheads. For China, logical alternatives might be:

1. Developing new delivery systems to fit existing warhead designs.
Using existing rather than custom-designed warheads is usually said to be less cost effective because the delivery systems are much more expensive than warheads, and because system performance can be sensitive to warhead design.[42] A delivery vehicle designed to accommodate an existing warhead would be constrained by the characteristics of the existing warhead.

2. Increasing the number of warheads.
An increase in the number of warheads and missiles can compensate to a certain extent the weakness in survivability of less advanced nuclear weapons. That increase, however, would be limited by the amount of stored nuclear materials. It has been unofficially reported that by 1991 China had stopped the production of weapons-grade plutonium. The government has said that China would promote the "earliest possible achievement" of a global agreement banning production of "fissile materials for nuclear weapons or other nuclear explosive devices."[43] The coming Fissile Material Cutoff Treaty would place a ceiling on the number of nuclear weapons of the nation. Considering its present inferior position, China may not have sufficient fissile materials in a post-CTB era to meet all forseeable needs.[44]

3. Cooperating to enhance safety and reliability.
In the post-CTB era, there is the question of what kind of stockpile stewardship program China should have. China's nuclear program would have to depend on its limited budget and technology to meet the new challenge of maintaining the nuclear arsenal under a no-test regime. Apparently, cooperative programs between China and other nuclear states for the safety and security of nuclear warheads would be expected. Technological cooperation in diagnostics and computer simulation would be helpful to reduce some concerns in this regard.[45] But this kind of cooperation relies to a great degree on good relations between China and other nuclear states.[46]

It is still unclear whether China would adopt these options after signing the CTBT. The Chinese position will be affected by many factors, including the attitudes of the principal nuclear-weapon states toward deeper reductions in their arsenals and toward a no-first-use commitment, as well as by the development of BMD by other countries.

Impacts on China's Security Policy

Although the signing of a CTBT will not fundamentally change China's security policy, which currently focuses on its conventional forces, it will have some impact.[47] Given that the development of nuclear weapons would be greatly constrained by a CTB, some changes and adjustments in China's security policy in the post-CTB era may have to be made:

1. Strengthening the efforts to improve strategic relations between China and the principal nuclear powers.

Although the Cold War has ended, nuclear threats have not disappeared completely. No-first-use negotiations and confidence-building with major nuclear weapons states would be continuous goals for China in order to win a secure environment.

From the beginning, China's reason for developing nuclear weapons was to survive the perceived nuclear threat from the United States and the Soviet Union. With the end of the Cold War, relations between China and Russia have obviously improved. In 1994, China and Russia declared a policy of non-targeting and non-first use of their nuclear weapons against each other. During President Boris Yeltsin's visit to Beijing in April 1996, the two countries signed an agreement to develop a "strategic partnership of equality, mutual confidence and mutual coordination directed towards the twenty-first century"; both sides agreed also to set up a Beijing–Moscow telephone hotline.[48] As for the United States, under the Clinton administration's Nuclear Posture Review, it is not likely to adopt a bilateral or universal no-first-use pledge any time soon.[49] Therefore, the attitude and the trend of the United States in this regard after the CTBT would be of serious concern to China.

2. Taking initiatives to seek more arms control steps, especially deeper cuts in the strategic weapons of the principal nuclear powers, that could mitigate worries about the inferiority of China's nuclear force.

Even after the START II treaty enters into force, the United States and Russia will each still have 3,500 deployed strategic warheads and several thousands more in store. Since these arsenals might continue to pose a threat to the survivability of China's nuclear weapons, deeper cuts in the number of strategic weapons of the principal nuclear powers would be a necessary objective for China to assure its retaliatory capability.

3. Strongly opposing development and deployment of advanced BMD systems, which could further degrade China's limited retaliatory capability.

As discussed earlier, Chinese nuclear strategy is to possess a limited but credible retaliatory force, so even if its nuclear weapons have been inferior in the past decades among the five nuclear states and would continue to be so after a CTB, this does not matter much as long as its limited nuclear retaliatory capability is not undermined. However, if the United States and Russia develop and deploy advanced BMD systems in the future, the effectiveness of its existing nuclear deterrent would face a great challenge, which may compel China to reorient its security strategy.[50]

4. Paying more attention to the role of arms control in its security policies.

During the Cold War years, China rarely involved itself in arms control negotiations, partly because of the sharp gap between its nuclear arsenal and those of the principal nuclear powers, and partly because of its deeply rooted mistrust of the superpowers. Since the adoption of the Open Door policy in the late 1970s, the new generation of leaders has taken a more active attitude toward arms control.[51] Because the world has become more and more interrelated, global cooperation in arms control is becoming an inevitable trend. The CTBT is the first treaty China has ever participated in that would have direct constraints on its nuclear weapon program. From now on, there will be more global arms control objectives that require China's participation and cooperation, such as the Fissile Material Cutoff Treaty, disarmament talks among the five nuclear states, and so on. China would have to pay greater attention to the role of arms control negotiations in a post-CTB era for the purpose of safeguarding its security interests while promoting global security, and it is likely that the Chinese government would attach greater importance to the nation's think tanks assigned to work on international arms control negotiations. The signing of the CTBT is a

great step for China in participating in the international arms control regime. In a post-CTB era, arms control policy in China would play a more important role in its security strategy than at any other time before.

Conclusions

Since the first nuclear explosion conducted by the Americans, nuclear testing has played a major role in the development of nuclear weapons over the past half-century. The effort to ban nuclear tests has also had a long history. Were one concluded forty years ago, a test ban treaty would have had far greater significance in preventing the arms race between the superpowers. Even so, the conclusion of the Comprehensive Test Ban Treaty in September 1996 is still worth celebrating. The five nuclear-weapon states have sent a strong and clear message to all the countries of the world that they will forgo a primary means of developing nuclear weapons. In the nuclear era, the treaty's symbolic significance is far-reaching.

Of course, we should note that the CTBT, which places unequal constraints on the nuclear states, also brings uncertainty for some nuclear states, like China. As a less developed nuclear-weapon state, China faces more constraints on its limited nuclear strategic force and is therefore more concerned about the implications of a CTB.

Many efforts, such as a deeper reduction of the nuclear arsenals of the principal nuclear powers, a no-first-use commitment by all nuclear weapon states, and the adherence to the ABM treaty by its signatories, will be critical to reducing China's concerns. The progress of international arms control negotiations in the above directions would further encourage China to make even greater contributions in the field of global arms control in a post-CTB era.

Notes

[1] Jozef Goldblat and David Cox, *Nuclear Weapon Tests: Prohibition or Limitation?* SIPRI, 1988, pp. 96–114.

[2] During and after the Korean War, the United States deployed nuclear-armed B-29 bombers to Guam for possible use against targets in China. The United States also deployed nuclear-capable weapons systems, presumably with nuclear warheads, on Taiwan in the 1950s. See Richard Fieldhouse, "China's Mixed Signals on Nuclear Weapons," *The Bulletin of the Atomic Scientists*, May 1991, p. 39; Banning N. Garrett and Bonnie S. Glaser, "Chinese Perspectives on Nuclear Arms Control," *International Security* 20, no. 3 (Winter 1995/96), 67. John Wilson Lewis and Xue Litai, *China Builds the Bomb* (Stanford, CA: Stanford University Press, 1988), 17–22, 29, 38.

[3] Mao Zedong, "On the Ten Major Relationships," *Selected Works of Mao Zedong*, Vol. 5, p. 288.

[4] "Statement of the Government of the People's Republic of China," *Renmin Ribao* [People's Daily], 17 October 1964.

[5] John W. Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age* (Stanford, CA: Stanford University Press, 1994), 232.

[6] Xie Guang, *China Today: Scientific and Technological Undertakings of National Defense*, Vol. 1, pp. 187–188, 223, 278–279, 384–385.

[7] Robert S. Norris, A. Burrows, and Richard W. Fieldhouse, *Nuclear Weapons Databook*, Vol. V, British, French, and Chinese Nuclear Weapons, p. 374.

[8] Guo Qingsheng, "China Has a Nuclear Counterattack Capability—A Visit to China's Strategic Missile Units," *Liaowang*, April 22, 1992, pp. 23–25.

[9] John Wilson Lewis and Xue Litai, *China's Strategic Seapower*,p. 233.

[10] Jozef Goldblat and David Cox, pp. 4–8, pp. 34–37.

[11] *The Bulletin of the Atomic Scientists*, May/June 1996, p. 62.

[12] Jozef Goldblat and David Cox, p. 52.

[13] Robert S. Norris, "French and Chinese Nuclear Testing," *Security Dialogue* 27, no. 1 (March 1996), 52, note 13; Thomas B. Cochran et al., U.S. Nuclear Warhead Production, *Nuclear Weapons Databook*, vol. V, p. 5. In comparison, the former Soviet Union/Russia had developed seventy-five types of nuclear weapons by 1988. See Thomas B. Cochran et al., Soviet Nuclear Weapons, *Nuclear Weapons Databook*, vol. IV, p. 2.

[14] *Toward a Comprehensive Nuclear Warhead Test Ban*, A Report of the International Foundation, January 1991, p. 4.

[15] Ray E. Kidder, *Assessment of the Safety of U.S. Nuclear Weapons and Related Nuclear Test Requirements: A Post-Bush Initiative Update*, December 10, 1991, p. B-1.

[16] Ray E. Kidder, *The Reliability and Safety of U.S. Nuclear Weapons and Related Nuclear Test Requirements*, July 23, 1992, p. 5.

[17] Ibid., p.1.

[18] "JASON Nuclear Testing Study," *Arms Control Today*, September 1995, pp. 34, 35.

[19] *The Arms Control Reporter*, 608.E.1, 1995.

[20] *The Science-Based Stockpile Stewardship Program—Maintain Confidence in the Safety and Reliability of the Enduring U.S. Nuclear Weapon Stockpile*, U.S. Department of Energy, Office of Defense Programs, May 1995, pp. 1, 3.

[21] Tom Zamora Collina, "Stockpile Stewardship Tool Box: Existing and Proposed Facilities," *The Arms Control Reporter*,1995, 608.E.1–6.

[22] *The Bulletin of the Atomic Scientists*, Jan/Feb. 1996, p. 43.

[23] "U.S. Postpones Nuclear Tests," *Asia Times*, June 6, 1996, p. 1.

[24] Tom Zamora Collina, "Crunch Time in Geneva," *The Bulletin of the Atomic Scientists*, May/June 1996, p. 11; Arjun Makhijani and Hisham Zerriffi, "The U.S. Can't Have It Both Ways," *The Bulletin of the Atomic Scientists*, March/April 1996, p. 37.

[25] *Nuclear Weapons after the Comprehensive Test Ban: Implications for Modernization and Proliferation*, SIPRI, 1996, p. 36.

[26] *The Arms Control Reporter*, 608.B.362, 1995, 608.B.392, 1996; R. L. Garwin, *A Report on Discussions Regarding the Need for Nuclear Test Explosions to Maintain French Nuclear Weapons under a Comprehensive Test Ban*, pp. 6, 8.

[27] *The Arms Control Reporter*, 608.B.355, 1995.

[28] Eric Arnett, "Nuclear Club Gets Clubbier," *The Bulletin of the Atomic Scientists*, April/May 1996, p. 12.

[29] John Wilson Lewis and Xue Litai, *China's Strategic Seapower*, p. 235.

[30] John Wilson Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, Goals," *International Security* 17, no. 2 (Fall 1992), 13, 26–30. Because of the lesser reliability of aircraft and the much higher technical and financial demands of operating a submarine, land-based missiles have remained the core of China's nuclear force. Thus the survivability of its missiles is extremely important for the effectiveness of its nuclear deterrence. Also see Xie Guang, *China Today: Scientific and Technological Undertakings of National Defense*, Vol. 1, pp. 73–74. Robert S. Norris,

A. Burrows, and Richard W. Fieldhouse, *Nuclear Weapons Databook,* Vol. V, British, French, and Chinese Nuclear Weapons, pp. 325–326.

[31] Thomas B. Cochran and Christopher E. Paine, *The Role of Hydronuclear Tests and Other Low-yield Explosions and Their Status under A Comprehensive Test Ban*, NRDC, April 1995, p. 21.

[32] Robert S. Norris, "French and Chinese Nuclear Weapon Testing," *Security Dialogue* 27, no. 1 (March 1996), 40.

[33] Xie Guang, *China Today: Scientific and Technological Undertakings of National Defense*, vol. 1, p. 220.

[34] Robert S. Norris, "French and Chinese Nuclear Weapon Testing," p. 54, note 37.

[35] John Wilson Lewis and Xue Litai, *China Builds the Bomb*, 1988, p. 70; *China's Strategic Seapower*, p. 239.

[36] Paul Godwin and John J. Schulz, "Arming the Dragon for the 21st Century: China's Defense Modernization Program," *Arms Control Today*, December 1993, p. 4.

[37] "Expert Defends Defence Spending," *China Daily*, 1 August 1995; Wang Hao, "China Is No Threat," *The Bulletin of the Atomic Scientists*, July/August 1996, p. 19; "Thousands Switch to Civilian-Style Nuclear Stations," *China Daily*, September 26, 1994.

[38] *China: Arms Control and Disarmament*, Information Office of the State Council of the People's Republic of China, November 1995, p. 13.

[39] Zou Yunhua, "A Complete Ban on Nuclear Testing Is the Inevitable Development of the Situation," *International Studies*, no. 1 (January 1994), 5, China Institute of International Studies.

[40] Jayantha Dhanapala, "Fulfilling the Promise of the NPT: The CTBT and Beyond," *Arms Control Today* 26, no. 4 (May/June 1996), 3. China's official position on the NPT today is different from that of the 1960s and 70s. During the Cold War, strongly opposing the nuclear powers' nuclear monopoly policies, China did not attend any multiple arms control negotiations. In the 1980s, China carried out policies of reform and openness, and détente emerged in the global community. Since then China has started to adjust its arms control policy. For the first time it sent a delegation to attend the Conference on Disarmament at Geneva in 1980, and reexamined many treaties it had not previously joined. As a result, China joined the BWC in 1984 and the NPT in 1992, with a new recognition that participating in the NPT regime is beneficial to its own security and to maintaining the stability of its neighboring regions, and helpful to cooperation with other states in other fields. Also see Pan Zhenqiang, *Global Disarmament and Arms Control*, p. 417.

[41] Guo Nei, "China Ceases Nuclear Tests," *China Daily*, July 30, 1996.

[42] Steve Fetter, *Toward a Comprehensive Test Ban*, p. 41.

[43] "U.S., China Reach New Accords on MTCR, Fissile Materials Cutoff Issues," *Arms Control Today*, November 1994, p. 28.

[44] Lisbeth Gronlund et al., "China and a Fissile Material Production Cut-off," *Survival* 37, no. 4 (Winter 1995–96), 147–67.

[45] "Perry Suggests Technology-Testing Deal to China," *Arms Control Today*, December 1994, p. 28.

[46] Eric Arnett, "Nuclear Club Gets Clubbier," *The Bulletin of the Atomic Scientists*, May/June 1996, p. 13.

[47] Paul Godwin and John J. Schulz, "Arming the Dragon for the 21st Century: China's Defense Modernization Program," *Arms Control Today*, December 1993, p. 4.

[48] Xu Yang, "Beijing, Moscow Move Closer," and "Joint Statement Outlines Goals," *China Daily*, April 26, 1996.

[49] Banning N. Garrett and Bonnie S. Glaser, p. 68, note 35.

[50] Li Bin, "The Effects of Ballistic Missile Defenses on Chinese Attitudes Towards Arms Control," *SSRC-MacArthur Newsletter*, no. 7, May 1995, p. 17.

[51] Banning N. Garret and Bonnie S. Glaser, p. 46.

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