



NUCLEAR RESET:

ARMS REDUCTION AND NONPROLIFERATION

**Edited by Alexei Arbatov
and Vladimir Dvorkin**

**English version edited by
Natalia Bubnova**

CARNEGIE MOSCOW CENTER

CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE

C A R N E G I E M O S C O W C E N T E R

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MOSCOW 2012

Nuclear Reset: Arms Reduction and Nonproliferation

Electronic version: <http://www.carnegie.ru/en>

This publication has been produced within the framework of the Nonproliferation program of the Carnegie Moscow Center, a non-commercial, non-governmental research organization, with the support of the Carnegie Corporation of New York.

The views expressed in this publication do not necessarily represent the views of the Carnegie Endowment for International Peace or the Carnegie Moscow Center.

The publication is distributed free-of-charge.

Scientific and technical support — Peter Topychkanov.

Design — Andrey Nikulin.

Nuclear Reset: Arms Reduction and Nonproliferation / Ed. by Alexei Arbatov and Vladimir Dvorkin; English version ed. by Natalia Bubnova; Carnegie Moscow Center. — Moscow, 2012. 523 p.

ISBN 978-5-905046-20-9

The book has been written by leading Russian military and disarmament experts within the framework of the Carnegie Moscow Center's Nonproliferation program. The authors focus on nuclear arms and strategies, and the reduction and nonproliferation of nuclear weapons, as well as on a broad spectrum of related issues, such as: banning nuclear tests, prohibiting the production of fissile materials, preventing the weaponization of space, and introducing controls on precision-guided weapons.

The book will be of interest to experts in international relations and security, as well as to a broader readership.

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ACKNOWLEDGEMENTS

The authors wish to thank the John D. and Catherine T. MacArthur Foundation, the Starr Foundation, and the Carnegie Corporation of New York for their support for the Nonproliferation Program, under which this book was created. The authors are grateful to the management, academic, and technical staff at the Carnegie Endowment for International Peace and the Carnegie Moscow Center for their intellectual contribution and organizational and technical support during the work on this book.

We are especially grateful to all of the Russian specialists from research institutions, government agencies, public centers, and the media who took part in the series of seminars and conferences held as part of this project during 2009 and 2010, and who expressed valuable opinions on the subjects studied.

Although the Nonproliferation Program was conducted and the present book written under the auspices of the Carnegie Moscow Center, the opinions expressed are only those of the Russian experts who authored its articles, and who take full responsibility for its content. The contributors to the book seek to address their analyses, criticisms, and proposals to political circles, academic communities, and informed members of the public in Russia, the United States, and other countries, who have an interest in preventing the proliferation of nuclear weapons and striving to reduce their numbers.

We wish to express our deep condolences on the untimely passing of our colleague and co-author of this book, Alexander Pikayev, head of the Department of Disarmament and Conflict Resolution of the Center for International Security at the Russian Academy of Sciences' Institute of World Economy and International Relations (IMEMO).

ABBREVIATIONS

AEOI	– Atomic Energy Organization of Iran
AF	– Air Force
ALCM	– Air-launched cruise missile
APR	– Asia-Pacific Region
BMD	– Ballistic Missile Defense
BTWC	– Biological and Toxin Weapons Convention
CFE	– Conventional Forces in Europe Treaty
CIS	– Commonwealth of Independent States
CSTO	– Collective Security Treaty Organization
CTBT	– Comprehensive Nuclear Test Ban Treaty
CTBTO	– Comprehensive Nuclear Test Ban Treaty Organization
CWC	– Chemical Weapons Convention
EC	– Export control
EU	– European Union
EURATOM	– European Atomic Energy Community
FMCT	– Fissile Material Cut-off Treaty
GC	– Gas centrifuge
GCS	– Global control system
GD	– Gas diffusion
GLCM	– Ground-launched cruise missile
GNEP	– Global Nuclear Energy Partnership
GP	– Global Partnership
GPF	– General purpose forces
HB	– Heavy bomber
HEU	– Highly-enriched uranium
IAEA	– International Atomic Energy Agency
ICBM	– Intercontinental ballistic missile

ICOC	– International Code of Conduct against Ballistic Missile Proliferation
IDC	– International Data Center
IEA	– International Energy Agency
IMS	– International monitoring system
IRBM	– Intermediate-range ballistic missile
IUEC	– International uranium enrichment center
LEU	– Low-enriched uranium
MAWS	– Missile attack warning system
MIRV	– Multiple independently targeted reentry vehicles
MPC&A NM	– Material physical protection, control, and accounting of nuclear materials
MRV	– Multiple reentry vehicles
MSC	– Military Staff Committee (UN)
MTCR	– Missile Technology Control Regime
NATO	– North Atlantic Treaty Organization
NFC	– Nuclear fuel cycle
NFU	– No-first-use pledge (of nuclear weapons)
NM	– Nuclear materials
NPP	– Nuclear power plant
NPT	– Nuclear Nonproliferation Treaty
NSG	– Nuclear Suppliers Group
NTMV	– National technical means of verification
NW	– Nuclear weapons
OSI	– On-site inspection
PGS	– Prompt global strike
PGW	– Precision-guided weapons
PIR Center	– Russian Center for Political Studies
PPWT	– Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects
PSI	– Proliferation Security Initiative
RTG	– Radioisotope thermoelectric generator
SALT-I	– Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms (1972)

SALT-II	– Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms (1979)
SBL	– Space-based laser
SC	– Spacecraft
SCO	– Shanghai Cooperation Organization
SDI	– Strategic Defense Initiative
SLBM	– Submarine-launched ballistic missile
SLCM	– Sea-launched cruise missile
SMFs	– Strategic missile forces
SNF	– Spent nuclear fuel
SNFs	– Strategic nuclear forces
SOC	– Strategic offensive capability
SOFs	– Strategic offensive forces
SRBM	– Short-range ballistic missile
SSBN	– Ballistic missile nuclear submarine
START-I	– Treaty between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms (1991)
START-II	– Treaty Between the United States of America and the Russian Federation on Further Reduction and Limitation of Strategic Offensive Arms (1993)
SWU	– Separation work unit
UAVs	– Unmanned aerial vehicles
TNWs	– Tactical nuclear weapons
WMDs	– Weapons of mass destruction

INTRODUCTION

Alexei Arbatov

Our contemporary assessments of nuclear arsenals and their capabilities and doctrines have been riddled with a level of trivialization that reduces the subject to something entirely formal and commonplace. This is happening for several reasons. First, people have simply gotten used to living with weapons of mass destruction 65 years after their first testing and military use. There is also a certain sense of general complacency – since these weapons have sat idle for decades, there is little sense in worrying about their future use.

Besides, the destructive power of this class of weapons is so huge that most people (except for those who survived the tragedies of Hiroshima and Nagasaki and perhaps those who took direct part in the tests) are simply unable to grasp it. Therefore, the deadly potential use of nuclear weapons turns into something purely abstract – the result of military, scientific, and engineering calculations. For example, in the 1960s and 1970s, the United States and the Soviet Union had strategic missiles, each capable of delivering a standard warhead with the yield equivalent to one to two megatons of TNT. Thus, each weapon had the explosive power of the sum of all the munitions discharged during the six years of World War II, which claimed more than 60 million lives.

In those years the U.S. strategic nuclear forces (SNF) deployed the largest nuclear warheads on the heavy Titan II intercontinental ballistic missile (ICBM) and the B-53 gravity bomb. According to unofficial estimates, at 9 MT, these warheads were 650 times more powerful than the Little Boy dropped on Hiroshima on August 6, 1945. By independent expert assessments, the most powerful Soviet mass-produced thermonuclear warhead had a TNT equivalence of 20 megatons. These were fitted on heavy R-36 missiles, which are classified in the West as SS-9. However, the explosive power record went to the Soviet hydrogen bomb, which was christened

“Kuzka’s mother” (“Kuzkina mat”) after Nikita Khrushchev’s famous threat “to show Kuzka’s mother” to Americans (a Russian saying meaning roughly “to teach someone a lesson”). Tested in October 1961 at the Novaya Zemlya Nuclear Test Range, this bomb had a TNT equivalence of 58 MT (or 4,000 times the Hiroshima yield). The shock wave from the test’s detonation went around the world three times, blasting out the windows of homes on Dickson Island, some 800 kilometers from the epicenter.

Aggregate estimates show that the total number of all types of nuclear warheads deployed by all nations at any one time had peaked at 68,000 units in 1984-1985. The total explosive force of the world’s nuclear arsenal peaked in 1974-1975, reaching the equivalent of about 25,000 MT, or 830,000 times the combined force of the two bombs dropped on Japan in August 1945, which had immediately killed a total of around 140,000 people.

At their peak, between 95 and 98 percent of all the nuclear warheads belonged to the Soviet Union and the United States, with the remainder held by China, France, and Great Britain. According to official data, the U.S. nuclear arsenal reached a maximum level of 32,000 nuclear weapons in 1967, with the Soviet Union independently estimated to have 45,000 nuclear weapons in 1985 (alternate assessments put the maximum Soviet nuclear forces level at 36,000-39,000 nuclear weapons.)¹ At the moment, unofficial estimates suggest that the world’s nuclear powers have approximately 23,000-25,000 nuclear weapons either in deployment or in storage,² with a total destructive energy equivalent of around 2,300 MT, or 150,000 times the power of the Hiroshima bomb.³

These mind-numbing explosive power numbers paint only a partial picture of the blast’s true impact. In reality, the destructive force would be much greater, enhanced by the emission of thermal radiation, initial and residual radiation, and electromagnetic impulse.

In the 1980s, U.S. and Soviet scientists conducted studies demonstrating that in the event of an all-out nuclear war, the dust, smoke, and fire of the resulting atmospheric pollution would block the sun on Earth for decades. This impact would cause an environmental change called “nuclear winter,” similar to the environmental catastrophe that killed the dinosaurs when the Earth was struck by a comet or meteor some 65 million years ago. Environmental studies conducted between 2007 and 2008 showed that even a limited engagement with the use of around 100 warheads (or a regional nuclear war) would

still destroy the ozone layer and fill the upper atmosphere with smoke for many years afterwards. Such exchanges would affect the environment, agriculture, and the general health of the population.

These issues are fairly common knowledge, which is precisely why they remain outside the context of current nuclear weapons debates. On the one hand, this sort of abstraction is inevitable (military policies and disarmament negotiations are both based on numerical assessments and scientific analyses), but on the other, these models, statistics, and technical specifications have also gradually begun to erase the very perception of the monstrous realities they represent. It is difficult to deal with something that has been “refined” to the point of being almost “sterile.” What is more, many Russian and foreign politicians and experts have continued to openly discount the “civilizing effects” of nuclear weapons on international relations, implying that the fear of nuclear disaster has been constraining the nuclear-weapon powers in the pursuit of their foreign and military policies.

Perhaps the presence of nuclear weapons and awareness of the monstrous consequences of their potential use really did avert the outbreak of World War III during the Cold War. However, even that assertion has been seriously questioned; on several occasions, disaster was averted by a mere stroke of luck.⁴ What is much more important, there is simply no basis for thinking that the specter of nuclear destruction will continue to save us from world war. The “civilizing effects” of nuclear weapons is an oxymoron; in other words, an inherently absurd term. A civilization whose security rests on its ability to completely destroy itself in a few hours (or, at most, days) does not deserve to call itself a “civilization.”

Therefore, the likely consequences of nuclear warfare are worthy of occasional reminder, lest people forget what actually stands behind those nuclear tables, charts, and diagrams (and what the real-life implications of these seemingly “rational” concepts and plans for nuclear warfare might be).

A safeguard like that is akin to suggesting that the trunk of every car be equipped with a sensitive explosive to force the driver into “civilized” behavior and respect for the rules of the road. This might even work for a while, as long as there were just a few cars on the road, but as their numbers grow, disaster becomes inevitable.

That is precisely what is happening to the problems of nuclear disarmament and nonproliferation. In other words, by perpetuating

the theory that nuclear weapons are an irreplaceable anchor of international security, and by failing to achieve real progress in nuclear disarmament negotiations, the world is opening the door to nuclear proliferation, thus making the use of nuclear weapons in military action or by terrorists inevitable at some point. This truism was best expressed by the international and non-governmental Canberra Commission on the Elimination of Nuclear Weapons in 1996, and was again summarized in the report by the International Commission on Nuclear Nonproliferation and Disarmament in 2009: "So long as anyone has nuclear weapons, others will want them. So long as any such weapons remain, it defies credibility that they will not one day be used, by accident, miscalculation, or design. And any such use would be catastrophic for our world as we know it."⁵

The process of understanding these truths has taken a long time and is by no means over today. In the 1950s and 1960s, disarmament was a subject of heated propaganda-laced battles waged at the United Nations and in other forums, but never in practical policy. Actual agreements on partial disarmament measures and nuclear weapons limitation and nonproliferation became a part of practical policy in the 1970s-1990s, with nuclear disarmament becoming a sort of ceremonial slogan. In the first decade of the 21st century (at the initiative of the Republican administration in United States), nuclear disarmament was declared to be an anachronism of the Cold War; efforts focused instead on nuclear nonproliferation through coercive force. The nuclear disarmament and nonproliferation regimes ended up deadlocked, and quickly unraveled as a result.

A new stage in the gradual evolution of this sphere of conscience and action came with the publication of a renowned article by four respected U.S. public figures who have never been described as idealists.⁶ They urged that nuclear disarmament once again be made a daily part of the actual policies of states and become an essential condition for the nonproliferation of nuclear weapons. Their appeal triggered a "renaissance" of nuclear disarmament ideas that were picked up by the Democratic Party candidate in the 2008 U.S. presidential election and became a part of the official U.S. policy line after President Barack Obama's election. This new vision of a world without nuclear weapons was reflected in a number of official documents signed jointly by the United States and Russia in 2009, as well as in the new START agreement that was signed in April 2010 and in the new military doctrines of the two countries.

At the same time, while it is important to acknowledge the significance of nuclear disarmament as an end goal, it is nevertheless necessary to recognize that this journey is not only incredibly complicated but is also fraught with serious risk. This is no place for “neo-Luddite” approaches that call for an “immediate ban” of nuclear weapons, their “placement outside the law,” or immediate reductions by orders of magnitude, or for the imposition of arbitrary dates for achieving final and comprehensive nuclear disarmament. Any such exercises would achieve nothing but to discredit the very idea of nuclear disarmament, thereby forcing another stalemate and reversing the achievements to date due to pressures from those who advocate having such arms.

A realistic and coherent approach to nuclear disarmament would demand the highest degree of realism and professionalism, with full consideration of all of the difficult and interdependent political, military, strategic, technical, and economic problems involved, and would require precise and cogent coordination of all the above elements of the nuclear disarmament process and its bilateral and multilateral formats. Furthermore, it would be necessary to combine these steps toward nuclear disarmament and nonproliferation with international treaties, military and technological initiatives, and even potential uses of force. Moreover, this would be just a prelude to the greatest challenge: the overhaul of the entire traditional international security system in order to ensure that nuclear disarmament does not remove the taboo against waging major warfare with conventional weapons, other kinds of weapons of mass destruction (WMDs), or systems based on new physical principles.

This is precisely the approach taken in the present collective effort. In a certain sense, this study may also be seen as a sequel to the book “Nuclear Weapons After the Cold War,” published by the Carnegie Moscow Center in 2006. The authors view this work as a next step in the continuing study of the subject, one that incorporates all the paramount changes that have swept this field of politics and science over the past five years.

The first part, entitled “**Post-Cold War Nuclear Weapons and Strategies,**” analyzes the extent to which new threats and modern great power relations have altered the understanding of the concept of strategic stability 20 years after the Cold War. It examines nuclear forces and their development programs and considers the strategic concepts adopted by the nine current nuclear-weapon

states. This section also provides a comparative analysis of the ways individual countries approach the modernization of their nuclear weapons and the extent to which their doctrines are offensively oriented, as well as of the willingness of such states to curtail their nuclear capabilities.

The second part, **“The Proliferation of Nuclear Weapons,”** looks at the global nuclear power development prospects and assesses the dangers that can overtake this process if its civilian aspects are put to military use. It takes a separate look at the precedent of such technology and materials being misused by the nuclear programs of Iran and North Korea. The history, dangers, and venues for easing tensions in the India-Pakistan nuclear standoff are also examined. It analyzes the threats posed by the global spread of missiles and related WMD technology and assesses the existing capabilities to better curb this process. Nuclear terrorism is given particular attention, seen here as a consequence of the proliferation of nuclear weapons, materials, and sensitive technologies.

The third part, **“Reductions of Nuclear Weapons,”** analyzes the offensive and defensive strategic arms relationship and the various limitation measures available. It provides a military and political assessment of START I, which expired in December 2009, and the New START that replaced it four months later. It analyzes the prospects of further strategic arms reductions and examines measures aimed at lowering the threat of unintentional nuclear war. Special attention is devoted to the relatively new problem of the limitation and reduction of medium-range and tactical nuclear weapons. Also analyzed are the prospects for nations to engage in deeper nuclear reductions that involve the controlled elimination and disposal of nuclear charges and the powers’ weapons-grade materials.

The fourth part, **“Strengthening Nonproliferation Regimes,”** looks at ways that the existing nonproliferation regime can be strengthened through a full-fledged system of measures that are interrelated and aim at dealing with top-priority threats. Most notably, it examines the issue of expanding and improving the reliability of the International Atomic Energy Agency (IAEA) safeguards, and of more stringent regulation of the right of states to withdraw from the Nuclear Non-Proliferation Treaty (NPT). It zeroes in on ways to limit the proliferation of nuclear fuel cycle technology, which is the primary channel used for diverting peaceful nuclear energy programs to military uses. It also analyzes ways to improve the ef-

fectiveness with which the United Nations and other institutions deal with nonproliferation issues.

The fifth and last part, “**At the Junction of Disarmament and Nonproliferation,**” studies the close relationship between nuclear disarmament and nonproliferation, beginning with the theories behind this interdependence and concluding with its practical implications, including: offering security assurances to nations that renounce the use of nuclear weapons; the entry into force of the Comprehensive Test Ban Treaty (CTBT); and achieving a ban on the production of fissile (weapons-grade) materials. It examines how precision-guided conventional weapons (PGW) impact the strategic balance of nations, and deals with the threat of a space arms race and the options available for preventing one. It analyzes the experience with the Global Partnership program, and examines the new problems that nations face in their efforts to maintain the safe and secure disposal of dangerous materials during the process of nuclear disarmament.

The **Conclusion** summarizes the authors’ analysis of the nuclear disarmament and nonproliferation problems, with the authors and editors presenting their findings and recommendations for further international security enhancements in this field. The editors have used it as an opportunity for developing and adding to the assessments and proposals that were made in the earlier chapters and sections of the book.

NOTES

- 1 T. Cohran, W. Arkin, R. Norris, and J. Sands, *Nuclear Weapons Data Book*, vol. IV (New York: 1989), P. 22-27.
- 2 In May 2010, the U.S. government published data disclosing the total number of U.S. warheads at 5,200 and lowering the global estimate to around 19,000-21,000 warheads. However, there was ambiguity surrounding its data calculation method.
- 3 *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers* (Canberra, 2009), P. 20.
- 4 Ibid.
- 5 Ibid.
- 6 G. Schultz, W. Perry, H. Kissinger, and S. Nunn, “Toward a Nuclear Free World,” *Washington Post*, 2006.

Part I

**Post-Cold War
Nuclear Weapons
and Strategies**

CHAPTER 1

DETERRENCE AND STRATEGIC STABILITY

Vladimir Dvorkin

Definition and Characteristics of Strategic Stability

Views on the concept of strategic stability and the principles of nuclear deterrence that are inextricably intertwined with these views first began to form in the Cold War era during the nuclear standoff between Washington and Moscow. It was through their gradual and mutual insight that the role nuclear weapons should play in preserving security (and the likely consequences of their massive use) began to clarify. During this period, the reference list of books providing definitions and interpretations of strategic stability grew extensively, first in the West, and then in the Soviet Union.

In the past, strategic stability has been viewed almost entirely through the prism of correlation between the strategic offensive and defensive weapons of the two sides. However, with the end of the Cold War and a new era of radically different military and political conditions and globalization processes, the meaning of the concept of strategic stability began to shift under the influence of new challenges and destabilizing factors.

These factors include the proliferation of WMDs, with nuclear weapons topping the list; the proliferation of missile technology and extended range missiles; the nuclear terrorism threat; and regional armed conflicts that escalate unpredictably and spill over into other regions. The list of destabilizing factors may be broadened to include increasing drug trafficking, the unpredictable emergence of new and dangerous strains of bacteria, climate change, environmental threats, and so on.

However, we should note a substantial asymmetry between the United States and Russia in the way they prioritize destabilizing factors. According to Russia's official view, for example, it considers the key factors undermining strategic stability to be the globaliza-

tion of NATO operations and range of responsibilities, the advance of NATO and its military infrastructure toward Russia's borders, and the U.S. development of long-range precision-guided conventional weapons, while it groups the proliferation of WMDs, missile technology, and international terrorism (issues of greatest concern to the United States) near the bottom.¹

Despite the drastic change in conditions and the need to transform the traditional interpretations of strategic stability, these to a significant extent retain their relevance today. First and foremost, such traditions fit into the context of U.S.-Russian negotiations on strategic nuclear arms reductions. They also play a role in determining acceptable parameters for the strategic balance, identifying ways to develop nuclear weapons, and forming national programs to maintain and build a nuclear weapons infrastructure.

A brief overview of the evolution of the traditional interpretations of strategic stability and nuclear deterrence would therefore be helpful.

Strategic Stability During the Cold War

Following a fairly extended period in which "strategic stability" meant different things to the United States and the Soviet Union, the June 1990 Joint Declaration between the two powers provided the first generally agreed-upon definition of the term.² It essentially replaced the old, amorphous and completely non-binding principle of "equality and equal security."

Strategic stability, according to the 1990 Declaration, was the correlation of U.S. and Soviet strategic forces (or a state of strategic relations between the two powers) that resulted in the lack of any incentive to deliver a first strike.

It declared that future agreements must provide strategic stability through stabilizing strategic nuclear weapons reductions and by maintaining a link between strategic offensive and defensive arms. Its list of stabilizing arms reductions included such principles as reduced concentration of warheads on strategic delivery vehicles and a preference for weapons systems with increased survivability.

Once the goal of removing all incentive for a first-strike had been set, it became necessary to identify the strategic objectives that

could compel a nation to deliver a first strike. The theoretical list of such objectives in such cases could vary, and include demonstrations of resolve and a desire to change the balance of nuclear forces in one's favor, to cause havoc in the adversary's conventional armed forces or to destroy a nation's military and industrial capacity (either a particular industry or entirely).

This was all replaced by the consensus that the possible objective of such strikes would be to prevent or substantially weaken an adversary's retaliatory response; in other words, the operational plans for a first strike would include the maximum destruction of the other country's strategic forces, including its communications and control systems.

These most general principles marked a significant step forward in the mutual understanding of the essence of the strategic relations between the two countries. However, it was not enough to merely frame these stances; in order to be implemented, they also needed to be transformed into the realm of substantiated and graphic numerical ratios.

The solution to this problem involved input from a vast number of U.S. and Soviet (Russian) experts, who produced a fairly impressive amount of work. Using special mathematical models and algorithms, the two nations would develop their concept (or rather, the levels) of strategic stability, with specific numerical indicators and coefficients. A set of computer programs then would use these to model a hypothetical exchange of nuclear strikes under various delivery options.

Such strategic stability models are hardly universal, and are still incapable of providing a clear answer to the way the two nations should proceed with military construction and arms control so as to ensure ultimate respect for their mutual security interests. Too many factors that simply fail to fit into these mathematical formulas seriously affect these processes.

Nevertheless, these models were used as the basis for calculating different scenarios for outcomes in the event that Moscow and Washington press on with efforts to limit and reduce their strategic offensive weapons, and were also used for assessing the general stability levels that existed in the 1960s, 1970s, and 1980s. The results showed that stability improved as the numerical parameters of the correlation of the forces evened out between the two sides during the second half of the 1960s. This stability was also

enhanced by a rise in the survivability of these forces and improvements in the early warning systems and communications and control systems. Stability peaked in the early 1970s, which coincided with the first strategic defensive and offensive arms limitation treaties. However, this level began to drop soon after the United States, and then the Soviet Union, began to deploy strategic ballistic missiles with multiple independently targeted reentry vehicles (MIRVs).

The Soviet (Russian) experts developed both broad and narrow definitions of the term “strategic stability.”

In its broadest sense, strategic stability was viewed as the outcome of the political, economic, military, and other measures taken by opposing states (or coalitions) that precludes either side from being able to commit military aggression.

In its narrowest sense, strategic stability was understood as the state of the strategic armed forces and of military relations between the states (or coalitions) themselves, characterized by fairly equal military potentials and with both sides refraining from any attempt to alter the military balance by exerting force against the other for a prolonged period of time.

The U.S. experts highlighted two elements of strategic stability: crisis stability and arms race stability. The first implied that a situation was stable if the two sides had neither a sufficiently serious opportunity nor the incentive to deliver a first nuclear strike (even in times of crisis); the second characterized stability based upon the level of incentives prompting the sides to enhance their strategic capabilities significantly.

According to the U.S. version, the crisis stability mechanism would operate as follows: strategic (“crisis”) stability would be considered disrupted once the opposing parties’ strategic forces have developed a rather high counterforce potential, i.e. the capability of destroying the other’s hardened fixed and mobile targets; at the same time, these forces would remain vulnerable to an adversary’s counterforce strike and (most importantly) would present a tempting target for a potential first strike (when a likely adversary would be able to use a relatively small part of its capabilities to destroy a substantial number of its opponent’s offensive systems.)

This is explained by the fact that, in times of serious crisis, each party will be faced with an incentive to deliver a first strike. In a strike such as this, a country would face the choice between attacking to destroy the adversary’s offensive weapons (and gain a mo-

mentous advantage in power) or losing its own vulnerable strategic weapons systems.

The situation can also become unstable if only one of the countries has forces vulnerable to an attack. It would still face the hard choice of either “using or losing” its arms, even if it lacked any hope of seriously damaging its opponent in a first strike. Knowing this, the adversary in turn would have a strong incentive to carry out a preemptive strike in order to prevent such an “attack of desperation.” In the meantime, the vulnerable party would be fully aware of the situation, and would realize that its adversary was now becoming motivated to deliver a preemptive attack, and so on and so forth. Because of this relationship, this particular balance of forces scenario implies the greatest likelihood of all of a crisis escalating into warfare, conventional conflicts developing and escalating into nuclear ones, and limited standoffs becoming global ones.

In order to avoid such scenarios, the parties need to be mindful of their opponent’s efforts to deploy new weapons systems. This would enable them to take counter-measures to prevent the adversary from gaining military superiority and damaging “crisis stability.” By thus disturbing the “arms race stability,” the two parties would end up getting drawn into another cycle of an arms and technology race.

It must be kept in mind that, while strategic offensive arms are important, they are only a part of the arsenals of nuclear-weapon states. Strategic nuclear forces determine strategic stability only to the extent to which they are able to achieve the regional or global strategic objectives of the armed forces. However, once these strategic nuclear forces have become dependent on conventional arms (or once nations intend to use conventional arms to destroy their opponent’s strategic nuclear weapons), the role of conventional weapons will also have to be taken into consideration in assessing strategic stability.

One of the more constructive definitions of strategic stability (when used in respect to strategic arms) that opens it to comprehensive systemic analysis states that strategic stability is a robust strategic nuclear balance that is maintained over a long period, despite the impact of destabilizing factors.

In that case, a strategic nuclear balance would be achieved when the two parties have reached an approximate cumulative parity in nuclear forces on the basis of their aggregate quantitative (effective com-

bat strength, total number of warheads, etc.) and qualitative (combat capabilities in various strike options) parameters. This implies approximate equality in counterforce capabilities, counterstrike potentials, and deterrence capabilities between the two sides.

Counterforce capabilities are usually measured by the number of strategic nuclear weapons they can destroy, including not only hard point targets, such as launching silos and command posts, but also mobile targets, the destruction of which is determined less by precision than by reconnaissance capabilities, flexible combat control, and effective retargeting. This does not preclude the task of simultaneously destroying other infrastructure facilities or administrative and industrial centers; however, the most important aspect of counterforce potential is the ability to destroy an adversary's strike potential.

The retaliation potential is defined by the country's ability to remove its weapons from destruction before the attacking warheads hit them. This capability depends on early warning system effectiveness, reporting and decision-making efficiency, and the operational availability of the weapons, and is measured by the number of warheads it would be able to save and its ability to destroy various types of targets.

The guaranteed deterrence potential (or, in other words, counterstrike effectiveness) is determined by the number of strategic nuclear weapons that have survived attack and their combat capabilities, taking their combat control characteristics into account.

Each individual component would play its own part in deterring an attack:

- the counterforce capability of one side stimulates measures to increase survivability of the other party's strategic nuclear weapons; however, this counterforce capability must not become excessive if both sides are striving for stability;
- the ability to remove a sufficient number of warheads from attack is an effective means of deterrence, making a counterforce strike senseless;
- the retaliatory strike potential provides the last means of deterrence against an attack and is viewed as the main means of deterrence.

In essence, what determines strategic stability is the extent to which each of these three components can remain balanced over a sufficiently long period, despite the potential impact of destabilizing factors.

This balance is not only needed for a guaranteed assurance of security, but also (and what is just as important) for the long-term prevention of future returns to confrontation and another arms race.

Therefore, strategic stability is in fact made up of two components. The first is its ability to deter global nuclear warfare. It accomplishes that by maintaining strategic nuclear balance between the adversaries and providing the guaranteed ability of the strategic nuclear forces to cause unacceptable damage to the aggressor in retaliation. The second involves the nation having the strategic nuclear forces (and accompanying development capabilities and plans) necessary to demonstrate the futility of efforts to gain unilateral advantages; in other words, the hopelessness of another arms race.

This is achieved by maintaining approximate general nuclear parity between the opponents, allowing them to have numerically equal forces, combat capabilities, and research and production facilities capable of providing a proper response to potential strategic nuclear arms challenges.

The deterrence criterion that was used for a fairly long time involved the threat of inflicting “unacceptable damage” on the opposite side through the destruction of the cities and industrial centers forming the basis of that nation’s military and economic strength.

However, the most glaring weakness of this approach was the uncertainty about what “unacceptable damage” actually was. Its magnitude can depend on historical, economic, social, psychological, and other factors that may vary from one nation to another. The criteria developed by people like Andrey Sakharov and Robert McNamara (concerning 400 to 500 megaton-range warheads) and some European analysts (who felt that deterrence could be secured with just a few weapons) were purely theoretical. There have been no major studies that have successfully broken ground in this field, either.

Experience has shown that discussions held to identify the agreed amount of acceptable loss have, for all practical purposes, proven fruitless, which is why it made more sense to use the approximate balance of the counterstrike potentials of the two sides as a criterion for deterrence.

These views of strategic stability were first developed in the United States, and then in the Soviet Union by the late 1980s, and in 1991, in one form or another, they became part of START I. They were incorporated into the similar START II and then START III Framework

Agreement, which was followed by the signature of the New START Treaty at the end of 2010.

Factors Affecting Strategic Stability

Until the present time, given the state of continued mutual nuclear deterrence between the United States and Russia, strategic stability has been affected by the combined impact of a variety of political, operative, strategic, military, economic, and technical factors:

- the survivability of strategic nuclear forces;
- ballistic missile defense systems;
- nuclear weapons belonging to third parties;
- conventionally-armed precision-guided weapons;
- space weapons;
- anti-submarine warfare.

The survivability of strategic nuclear forces. As noted above, strategic stability is affected first and foremost by the structure of a nation's nuclear triad and the parameters of the weapons in these groups.

Until the mid-1980s, the backbone of the Soviet Union's potential in the nuclear balance had been MIRV-ed missile systems in silos hardened to ensure a fairly strong second strike capability. At the same time, the United States had perceived these as destabilizing systems that in its view combined a strong counterstrike capability with reduced survivability. Since these intercontinental ballistic missiles (ICBMs) were fitted with multiple reentry vehicles (RVs), just one or two weapons would be sufficient to destroy up to 10 opposing warheads. The danger of losing so many missiles in one attack could prompt nations to deliver a launch-on-warning or even preemptive strike that would threaten to dramatically escalate the situation.

Fixed-site ICBMs with single warheads were regarded as considerably less destabilizing arms systems. Being vulnerable, these systems could have still been used to deliver a launch-on-warning attack. However, they themselves were relatively low-value targets in any potential disarming strike.

In the meantime, mobile ICBMs and submarines with sea-launched ballistic missiles (SLBMs) were traditionally recognized as the most stabilizing weapons systems since they were to provide the main punch of an effective retaliatory strike, making them cen-

tral to the nation's nuclear deterrence while (until recently) playing no significant role in disarmament capabilities.

In truth, before START I, the United States had also considered the verification difficulties presented by mobile ICBMs to be a negative attribute that provided an opportunity to secretly build up missiles, deploy missile launchers in mountain ranges, and so on. These very concerns had led to the introduction of additional accounting, inspection, and notification rules for mobile ICBMs.

As far as ballistic missile submarines are concerned, beginning in the mid-1980s the Trident II SLBMs with W-88 warheads began to pose a major threat to Soviet (Russian) ICBMs and thus became a significant destabilizing factor. Only the U.S. decision not to deploy more than 400 W-88 warheads helped to diminish this destabilizing impact. However, it may increase again in the future as Russia continues its deep fixed-site and mobile ICBM reductions.

Experts also periodically discuss the destabilizing role of ballistic missile submarines and heavy bombers stationed at a limited number of bases during peacetime, because these two categories of weapons have a high concentration of warheads and represent attractive targets for a disarming strike. However, during periods of threat (which under any realistic scenarios of conflict would inevitably precede military action with any types of weapons), submarines would depart for their patrol zones and heavy bombers would be dispersed to a large number of reserve airfields to remain on standby for take-off. As a result, their destabilizing impact cannot be considered as being significant.

Ballistic missile defense (BMD) systems can either undermine or enhance strategic stability. They can undermine strategic stability if they create an increased risk of a disarming strike by protecting a country that initiates it against a massive retaliation by intercepting a substantial portion of the incoming missiles and warheads, but they can help to maintain strategic stability when they protect the bases of ICBMs, ballistic missile submarines, strategic aviation, and command and control centers, and nothing more.

This was the principle guiding the United States and the Soviet Union during their conclusion of the 1972 ABM Treaty and its 1974 Protocol.

At the same time, as the BMD communications and weapons systems became more technologically advanced, their capabilities expanded to a point that, for example, two regions of Ground-Based

Interceptor (GBI) missiles, one in Alaska and another in California, could protect the entire territory of the United States. In other words, this BMD is already a national system, but for now, it has violated the maintenance of strategic stability only theoretically, since 30 GBIs could in no way affect Russia's existing nuclear deterrence capability. The same may be said of the U.S. administration's plans for a third BMD zone in Europe.

However, such decisions have been destabilizing from a political perspective, contradicting U.S.-Russian agreements on strategic partnership and the joint development of a ballistic missile defense system, as well as creating significant long-term uncertainties for Russia.

The BMD may become truly destabilizing if a nation has engaged in a massive buildup of ground, sea, air, and space systems to effectively intercept missiles and warheads at any stage of their flight path (a more detailed assessment of the impact of the U.S. BMD system on Russia's deterrence capabilities is provided below.)

The nuclear weapons of third countries since the Cold War era have been viewed by the Soviet Union (and then Russia) as being potentially complementary to the counterforce capabilities of U.S. strategic nuclear forces. This would especially be the case during joint planning of disarming strikes against the Russian (Soviet) nuclear triad. The threat assessment of a joint nuclear attack from NATO in such cases may grow following deep cuts in U.S. and Russian strategic nuclear forces. In addition, the governments of Britain and France, although still significantly reducing the size of their forces, are not making development of their nuclear forces dependent on the ongoing U.S.-Russia disarmament negotiations.

Russia believes that such disarming strikes could primarily target the patrol areas of its mobile ICBMs and ballistic submarine and strategic aviation bases. Nevertheless, although the British and French capabilities have traditionally been viewed as destabilizing, their presence has not had a telling impact on the future of the development of the SNF programs of the Soviet Union (or later of Russia); neither have they affected the strategic nuclear arms limitation treaties nor the Medium Range Nuclear Forces (INF) Treaty.³

Britain and France undertook unilateral voluntary steps to reduce their nuclear arsenals in the 1990s, limited entirely to non-strategic arms (British aerial and anti-submarine deep-sea bombs, and French land-based medium-range ballistic missiles and front-line short-

range missiles). Currently, Britain has four strategic submarines armed with U.S.-made Trident II missiles.⁴ The British government reports having slashed the number of their warheads to 160, which is just over a quarter of their potential capability. France has also preserved a small aviation component in addition to its four submarines. It remains the only nuclear power to have nuclear delivery vehicles on an aircraft carrier, the *Charles de Gaulle*.

This means that with the passing of the Cold War, Europe's nuclear-weapon powers have almost completely abandoned the nuclear capabilities that could conceivably be used in a European military conflict. This, in turn, has even further diminished their role in reinforcing U.S. nuclear capabilities in Europe.

Great Britain is currently debating the possibility of reducing its future strategic submarine fleet to three submarines, and France will also find it difficult to avoid a new round of unilateral nuclear cuts should there be another wave of such disarmament in the United States and Russia.

Unlike Britain or France, China, so far as is known, has never undertaken unilateral disarmament measures. However, with the passing of the Cold War, its efforts to modernize its nuclear forces have focused on qualitative improvement rather than on increasing numbers, although in light of its strong gains in economic power, military budgets, and military and technological advances, China's arsenal could potentially grow by hundreds of warheads, if the corresponding political decision were made.

During the Cold War, the Soviet Union viewed tactical nuclear weapons (TNWs) as complementary to the strategic nuclear forces of the United States, which deployed tactical nuclear weapons at its forward bases in Europe and Asia and placed them aboard its ships and submarines. Nevertheless, since TNWs were primarily planned to be used in scenarios involving escalating conventional war in theater operations, the United States and the Soviet Union failed to ever agree on the role they played in strategic stability. From the Soviet standpoint, they were a destabilizing means for a first strike by the United States. From the NATO perspective, they represented a counterweight to the Soviet and Warsaw Pact's superiority in general purpose forces (GPF).

The parties found themselves on opposite sides of this equation after the end of the Cold War, when the Soviet Union and the Warsaw Pact had dissolved and Russia was severely weakened by a protracted

economic crisis and military reforms. Now it was Russia that viewed TNWs as a stabilizing element of theater balance, one that compensated for the relative superiority in GPF during NATO's expansion to the east. At the same time, a series of parallel unilateral U.S. and Soviet/Russian initiatives helped to reduce these TNWs to just a fraction of their initial size. Unlike the situation during the Cold War era, the United States and its allies are becoming increasingly insistent on limiting and eliminating TNWs altogether.

Long-range conventional precision-guided weapons (PGWs) first appeared in the late 1970s in the form of sea-launched cruise missiles (SLCMs), which were meant for U.S. ship- and submarine-launched strikes against an adversary's territory. However, the Soviet Union did not treat these weapons as a particular threat during the Cold War era. As a matter of fact, the only disagreement over them at the START negotiations arose because the national technical means of verification (NTMV) could not easily distinguish between nuclear and non-nuclear SLCMs.

Since the end of the 1990s, the massive U.S. deployment of PGWs and their efficient application in the local wars of 1999, 2001, and 2003 have prompted some experts to view them as a serious destabilizing factor. In their opinion, these systems could potentially provide a counterforce capability comparable in effectiveness to that of a nuclear disarming strike. The new 2010 Military Doctrine of the Russian Federation accorded top priority to this threat, as well as to Russia's "ability to ensure the air defense of the Russian Federation's most important facilities and readiness to counter air and space strikes."⁵

Indeed, the capabilities and ranges of precision-guided weapons are being constantly refined, which is also the case with space- and air-based reconnaissance systems and navigation and targeting equipment. This has been confirmed by the two wars in the Gulf during the past two decades and the conflicts in Yugoslavia and Afghanistan. However, when assessing the ability of these weapons to disturb the U.S.-Russian nuclear balance, their role should be put in the context of realistic scenarios for military activities.

First of all, wide-scale conventional operations require extended preparations that involve massive deployments and redeployments of troops, the navy, and aviation. These efforts take months to prepare and are virtually impossible to hide (experience shows this to be the case even for far smaller operations than those hypothetically

involving Russia.) In such a scenario, the Russian Armed Forces (including the nuclear triad) would be put on full alert, ensuring the utmost level of dispersal and camouflage. Therefore, the precision-guided weapons would only really be able to attack some of the fixed-site facilities, such as launching silos and command centers, that are otherwise protected from air strikes by area and site air defense systems. The majority of Russia's mobile ICBMs, whose self-propelled launchers patrol vast areas and are well-camouflaged from optical and radar reconnaissance means, and sea- and ocean-patrolling missile submarines would, on the other hand, preserve a considerable nuclear deterrence capability even after a disarming strike not only by conventional, but even by nuclear weapons.

Second, the sea- and air-based precision-guided weapons would simply be incapable of simultaneously destroying all of Russia's dispersed fixed-site targets even if they have been spotted by reconnaissance. For obvious reasons, such strikes are extremely difficult to plan; Russia's territory is simply too vast, and many of its systems are out of range of the presumed positions of the precision-guided weapons. Therefore, any strike that tries to disarm Russia's nuclear forces with conventional precision-guided weapons will necessarily involve a fairly sustained military operation that is certain to prompt an active Russian rebuff, despite the significant superiority of the U.S. and NATO in general forces. However, one must also remember that these strikes would spread beyond Russia's nuclear forces and also include the warring parties' entire range of military and industrial facilities.

Finally, so far as is known, the Soviet Union/Russia has always considered all of the potential conventional warfare scenarios and assessed their corresponding level of acceptable nuclear triad losses. If these levels are exceeded, then the Soviet Union/Russia believes in taking retaliatory measures involving the use of nuclear arms. In essence, these very same provisions were established in the Russian military doctrines of 2000 and 2010.

This is all indicative of the complete inanity, both from a military standpoint and from a political and economic perspective, of planning such military operations against Russia either by NATO or the United States. Thus, for the official members of the so-called "nuclear club," scenarios involving wide-scale disarmament strikes using conventional precision-guided weapons may be viewed as little more than theoretical talk.

Space weapons are combat systems deployed in space, on land and at sea for striking objects in and from outer space. During the Cold War era, only a limited number of such weapons (anti-satellite systems) were deployed by the United States and the Soviet Union, and they never played any significant role in the strategic balance.

In the future and under certain circumstances, space weapons could undergo further development and serve as anti-satellite weapons of varied deployment and as space-based BMD systems. In that case, they could not only be a destabilizing factor in the nuclear balance equation but also have a substantial impact on vertical and horizontal nuclear proliferation.

In the near term, the United States has the greatest potential for deploying space weapons. If such a decision is made, Russia's best option for parrying the overwhelming U.S. superiority in carrying out military activities in the arena of space would be to build up its nuclear weapons and develop anti-satellite systems. The United States would probably counter by improving its SNF and BMD capabilities, a move that would inevitably and at a minimum violate the "arms race stability" between the two sides and potentially breach "crisis stability" as well.

Anti-submarine defense during the Cold War and to the present day has always been regarded by the Soviet Union/Russia as a destabilizing factor. From the time the first SSBNs set to sea, the United States and Russia have sought ways both to counter them and to enhance their combat viability at sea. In the 1970s, the United States created the SOSUS global submarine hydro-acoustic surveillance system, which proved fairly effective in tracking submarines. SOSUS antennas were deployed along the east and west coasts of the United States, and at the anti-submarine frontier line of the North Cape of Norway, Medvezhy Island in the Barents Sea, Greenland, Iceland, the Faroe Islands, and Britain, as well as in the Pacific Ocean.

In addition, the United States also conducted systematic surveillance of the Soviet submarines in the Soviet Union's coastal zones. The Soviet Union/Russia has been further hampered by the relative noisiness of its submarines.

In the late 1970s and early 1980s, the Soviet Navy received its deliveries of the Project 667B, 667BD, 667BDR, and later Project 941 Typhoon and 667BDRM submarines with intercontinental range missiles. From then on, the Soviet ballistic missile subma-

rines have no longer had to break through submarine interdiction areas to reach their patrol zones, and U.S. anti-submarine activities have primarily focused on covert surveillance of Soviet ballistic missile submarines in coastal waters. The mission of countering U.S. anti-submarine defenses fell to Soviet surface ships, submarines, and anti-submarine aircraft, aided by the hydro-acoustic system of underwater surveillance.

Nevertheless, modeling carried out in the early 1990s by Western experts of the way that military operations might unfold showed that in the early stages of a war, anti-submarine operations could destroy up to 30 to 40 percent of Russia's strategic submarines.

This means that from Russia's perspective, anti-submarine defenses remain one of the most significant destabilizing factors of the strategic balance. The United States did take a positive step in relieving some of Russia's concerns: it closed down the Sea Wolf program, which had involved the construction of an advanced multipurpose nuclear submarine to replace its Los Angeles class submarines, one of the main means for covertly observing Soviet strategic submarines with ballistic missiles (SSBNs). Yet it must also be noted that to this day, the United States believes that it cannot afford to limit either the scale of its anti-submarine activities or the regions covered.

This means that beginning in the Cold War and throughout the early 1990s, Russia's strategic stability continued through inertia to depend on the following determining factors, which are listed here in terms of priority:

- ensure the survivability of the strategic nuclear forces and their ability to deliver unacceptable damage in a retaliatory strike in any early war scenario;
- limit BMD systems, their territorial ranges, and the ability of each side to penetrate the other's BMD defenses in order to guarantee their retaliatory strike potential;
- ensure approximate equality in the respective numbers of strategic nuclear warheads and delivery vehicles of both sides.

The following three criteria figured prominently in Soviet approaches to the problem, without ever being accepted by the United States or stipulated in ABM Treaty provisions:

- the role and contribution of third parties to strategic stability;

- the ability of U.S. general purpose forces and forward-based dual-purpose systems to deliver operational and tactical nuclear weapons;
- NATO's anti-submarine defenses in the Atlantic Ocean and the Navies of Japan and the United States in the Pacific Ocean.

Strategic Stability and Nuclear Deterrence Under New Conditions

As noted above, the new threats and destabilizing factors that emerged at the end of the last century and beginning of the present have encouraged countries to substantially broaden their perception of strategic stability. However, such broadened views have also stripped it of clear and precise meaning, complicating the efforts of these countries to agree on what strategic stability actually entails. Of course, it would also be incorrect and unrealistic to try to preserve the old understanding of strategic stability developed for the Cold War era and of the principle of nuclear deterrence closely associated with nuclear stability.

To paraphrase Winston Churchill, at one time one could say that nuclear deterrence was the worst means to prevent a global nuclear war, except for all of the other means available. This contradiction is now becoming so obvious that it is forcing countries to radically reconsider and reassess the role of nuclear deterrence in ensuring the security of the great powers and the world community as a whole.

This is happening, first, because nuclear deterrence has been failing to meet the real challenges and threats of the post-Cold War world. Deterrence remains effective against the least likely and most far-fetched threats, such as nuclear exchanges and all-out conventional conflicts between the two great powers and their allies. However, it is completely useless against such new, real security threats as the proliferation of nuclear weapons, international terrorism, ethnic and religious conflicts and their consequences, proliferation of drugs, trans-border crime, illegal immigration, and so on.

The second point is that what does remain of nuclear deterrence (primarily in its role deterring the nuclear capabilities of the United States and Russia) severely limits the great powers' ability to closely cooperate in providing a cohesive joint answer to these new chal-

lenges and threats. The first evidence for this emerged with Russia's strong resistance to plans to deploy U.S., NATO, and Japanese BMD systems to protect against the nuclear and missile threats of "rogue states." Both Russia and China believe that these systems threaten their own nuclear deterrence capabilities.

A nuclear stand-off, even when moved to the back burner of current policy, hampers the cooperation of national intelligence communities and armed forces engaged in special operations against terrorists (such as the Proliferation Security Initiative, Operation Active Endeavor, and others).

The third point is that the nuclear powers spend significant financial, intellectual, and technological resources to maintain nuclear deterrence that could be more effectively used for joint global and regional security initiatives.

Finally, it must also be noted that proliferation of nuclear weapons and their delivery means would not lead to an automatic reinstatement of deterrence and strategic stability on a regional scale. It is now overwhelmingly clear that strategic stability and nuclear deterrence, for which systems have been developed over decades and which include provisions for avoidance of accidental use, have almost no place at the regional level in relations between the new nuclear-weapon states.

Stability would be destroyed for good should proliferation and the inevitable (in this case) acquisition of nuclear weapons by terrorists continue or increase. This would completely eliminate all of the nuclear deterrence mechanisms that until now have provided the means for assuring national and international security.

With the new threats and processes described above, a continued reliance on nuclear deterrence as the main foundation of security (which has incorporated significant stabilizing components over the years of global confrontation, and in the absence of anything better has served to avert the outbreak of World War III) will not only result in an inevitable erosion of strategic stability, but will also increase the chances of nuclear weapons being used in combat or terrorist activities, an eventuality of catastrophic consequences for modern civilization.

Measures aimed at transforming the principles of mutual nuclear deterrence stage-by-stage have been under development for many years, based on further reduction of the strategic nuclear arsenals of the two nuclear superpowers and a reduced reliance on nuclear

deterrence in the national doctrines and security policies of the two sides. They further foresee that the United States and Russia will no longer rely on early warning systems for potential strikes and will reduce the operational and technical readiness of their land- and sea-based missiles. Finally, the two countries have been urged to introduce a common missile warning system and engage in the joint development and operation of future BMD systems.

These and other measures should essentially not only maintain but also improve the level of strategic stability. However, before this can occur, certain conditions must first be met in order to downscale the destabilizing factors described above.

First of all, once the United States and Russia have cut their strategic arsenals to 1,550 warheads in accordance with the New START, the nuclear triad structures of the two countries should be based largely upon highly survivable weapons systems. This applies primarily to Russia's nuclear triad, since the U.S. deterrence forces will continue to rely on missile-carrying submarines. For Russia, it would make sense to deploy mobile ICBM systems with MIRVs. Looking at the sea component, Russia needs to urgently upgrade the performance of its submarines to enable at least 50 percent of them to be dispatched on patrol at any one time.

These steps are quite likely to lead the two nations to question the merits of preserving the three traditional elements of their strategic nuclear forces: the ground, sea, and air components. As far as is known, the United States periodically engages in discussions on this subject, with some proposals suggesting that either the ground or air component be abandoned. Supporters of a continued development of land-based ICBMs (among them governors and senators with ICBM bases in their constituencies) are driven primarily by social and economic concerns for their states and not by any overriding security considerations. However, this is not an issue in the discussion of the re-orientation of heavy bombers for conventional missions, since these bombers' bases will stay in place in either eventuality. At the same time, opinions are periodically voiced in U.S. military circles, on the one hand, about the undefined role of heavy bombers in assuring nuclear deterrence, and, on the other hand, about the insufficient number of air force groups armed with precision-guided conventional systems.

There are almost no such discussions in Russia, which is a shame. It would seem that Russia could maintain a stable strategic nuclear

parity with United States at reduced levels by relying only on its land- and sea-based SNFs, and equip its heavy bombers with conventional precision-guided weapons to improve the combat effectiveness of its general purpose forces. In such a case, they would be intended for combat missions along lines of threat, and would never cross Russian borders through a potential adversary's air defense coverage.

The destabilizing impact of BMD defenses, even if deployed unilaterally by the United States in the format proposed by the Obama administration, would be negligible under the terms of New START, especially considering the high effectiveness of Russian ICBMs and SLBMs in overcoming BMD defense. This can primarily be explained by the significantly reduced impact that any disarming strike would have on Russia. Any retaliatory attack by Russia's strategic nuclear forces (its nuclear deterrence capability) would thus be far more effective than it would have been under the strategic nuclear limitations imposed by the Moscow Strategic Offensive Reductions Treaty (SORT) (1,700-2,200 warheads) and even more so under the terms of the New START. A disarming strike would become completely pointless once the U.S. and Russian strategic nuclear forces have been reduced to a 1,000-warhead level with a rational structure of SNFs, because the attacked party would have even more missiles and warheads with which to carry out a retaliatory attack. However, a unilateral deployment of BMD defenses would inevitably lead to political tensions between Moscow and Washington, negatively affecting attempts to combine efforts to overcome real challenges and threats.

The most conducive environment for strengthening strategic stability would be created if the United States, Russia, and the leading nations of the European Union were to engage in the joint development, deployment, and operation of a BMD system, with the subsequent inclusion of China in some of the system's components. In that case, a fundamental transformation would occur not only in the mutual nuclear deterrence of the two nuclear superpowers, but also in the principles of nuclear deterrence that underlie the security policies of the official members of the "nuclear club."

At the same time, an assessment can be made of what would happen to strategic stability if strategic offensive nuclear weapons cuts were to go deeper (to below 1,000 warheads), taking into account the increased number of destabilizing factors, following an in-depth study

of such destabilizing factors as precision-guided weapons, the nuclear arsenals of other states, anti-submarine defenses, and other factors.

Strategic stability could be strengthened even further through a series of administrative and technical measures aimed at reducing missile alert levels in these countries. This relates directly to the necessity that Moscow and Washington forego counterstrike launch planning based on early warning system data. Such measures are explained further in Part III of this book and appear in full detail in Alexei Arbatov and Vladimir Dvorkin's earlier work, "Beyond Nuclear Deterrence," published in 2006. Here we would like to mention only that a draft Executive Agreement was prepared on urgent measures intended to prevent missile launches in response to false alarms that would obligate the United States and Russia to exclude launches of their land-, sea- and air-based missiles based on early warning systems from their military planning for strategic offensive systems. This draft Agreement relies on tested inspection procedures for ensuring that reliable multi-form controls are in place to guarantee that the nations comply with the reduced levels of alert. One possible option for instituting reduced alert levels would be for the United States and Russia to reduce the numbers of their nuclear forces subject to being placed on high alert to a level equivalent to the combined forces of Britain, China, and France. This, in turn, would help to advance the inclusion of the latter countries into a multilateral system of nuclear arms limitations, and would also practically exclude the possibility of the destabilizing impact that British and French nuclear weapons might hypothetically have on the strategic nuclear balance between the United States and Russia.

However, with these new conditions in place, strategic stability and its consolidation, in particular through nuclear arms reductions, could still be irreversibly ruined if countries should deploy offensive space systems or land-, air- and sea-based weapons intended for striking space objects. The destabilizing impact of the resulting arms race in space would be much greater than what has previously been seen, and would lead not only to vertical and horizontal proliferation of nuclear weapons, but also to an undermining of the entire nuclear nonproliferation regime. Therefore, the measures discussed here for averting this military and political scenario are becoming ever more pressing with time.

Consequently, the concept of strategic stability in an era of globalization and of an altered military and political environment has ex-

panded a great deal from the traditional view, having now to account for emerging threats and destabilizing factors. There should be no attempt to retain the traditional understanding of the concept, which relates to the Cold War era and is closely associated with the mission of nuclear deterrence. Still, several of the stability principles it contained will remain largely relevant for the future, particularly in the context of the nuclear weapons reduction process.

Such an understanding of strategic stability may undergo a transformation with the further reduction of U.S. and Russian nuclear arsenals to some 1,000 warheads, in light of the meaninglessness of planning disarming and launch-on-warning strikes at those levels.

The past and present list of destabilizing factors includes strategic nuclear weapon vulnerability, ballistic missile defense systems, conventional precision-guided weapons, and anti-submarine defenses.

The unilateral deployment of a BMD system could undermine strategic stability if it is capable of protecting a nation's territory from a massive nuclear attack by intercepting most of the incoming missiles and warheads at any phase of flight by land-, sea-, air- and space-based means. Neither a limited number of GBI strategic defense missiles in Alaska and California nor a European BMD system under the new architecture announced by the Obama administration would be able to impact the nuclear deterrence potential of a country like Russia, yet it would markedly increase the mistrust and contradictions in U.S.-Russian relations, negatively impacting the consolidation of efforts to overcome the new challenges and threats.

The most conducive environment for strengthening strategic stability would be created if the United States, Russia, and the leading nations of the European Union were to engage in the joint development, deployment, and operation of a BMD system, with the subsequent inclusion of China. In that case, a fundamental transformation would occur not only in the mutual nuclear deterrence of the two nuclear superpowers, but also in the principles of nuclear deterrence that underlie the security policies of the official members of the "nuclear club."

The nuclear arsenals, precision-guided weapons, and anti-submarine defenses of Britain and France would affect strategic stability under these new conditions to a lesser extent, while the deployment of arms in space and/or attack systems on land, in the air, and at sea for striking objects in space could completely destroy strate-

gic stability, causing both the vertical and horizontal proliferation of nuclear weapons.

Deterrence remains effective against the least likely and most far-fetched threats, such as nuclear exchanges and all-out conventional conflicts between the two great powers and their allies. However, it would be completely useless against such new, real security threats as the proliferation of nuclear weapons, international terrorism, ethnic and religious conflicts and their consequences, drug trafficking, trans-border crime, illegal immigration, and so on. Its transformation, meanwhile, would involve further strategic nuclear arms reduction by the two nuclear superpowers and a reduced reliance on nuclear deterrence in the national doctrines and security policies of both sides. It would also mean that the United States and Russia would renounce strike planning based on data from early warning systems, would reduce their operational and technical readiness to launch land- and sea-based missiles, and would create a joint U.S.-Russia missile warning system and engage in the joint development and operation of future BMD systems. At the same time, as Russia reduces its number of strategic nuclear weapons, it should increase its reliance on mobile systems in its land component and upgrade the performance characteristics of its submarines in order to enhance their survivability.

These and other measures would unconditionally increase strategic stability and, by strengthening the nonproliferation regime, would significantly lessen the impact on the world of both the traditional and the new destabilizing factors.

NOTES

- 1 The President of Russia, *The Military Doctrine of the Russian Federation*, Feb. 5, 2010, http://news.kremlin.ru/ref_notes/461.
- 2 I. Sergeev, "The No-First-Strike Option," *Rossiiskaya Gazeta*, Nov. 13, 2001.
- 3 One important exclusion concerned Soviet efforts to calculate the nuclear capabilities of Britain and France as it tried to gain a numerical advantage in Soviet SSBNs listed under START I.
- 4 Their warheads are British-made and have no counterforce capability, making them similar to the U.S. Navy's Trident II W-88 warheads.
- 5 The President of Russia, *The Military Doctrine of the Russian Federation*, Feb. 5, 2010, http://news.kremlin.ru/ref_notes/461.

CHAPTER 2
**THE MODERN ARSENALS OF
NUCLEAR STATES**

Alexei Arbatov

The reliability and accuracy of the vast mass of published information on national nuclear arsenals has been inconsistent at best, applying both to the past and the present and presenting both subjective and objective explanations. The former include the varying degrees of openness of official data on current and future nuclear forces and the differing levels of freedom to discuss these subjects. A further complication has been the difficulty by which expert communities in various countries assess and classify different categories and systems of nuclear warheads and delivery vehicles. More objective reasons for the insufficient accuracy of data include the variety of weapon counting methods and the constantly changing status of the actual nuclear systems (which can be on alert, deployed, undergoing repairs, being stored at military bases or in central storage, still in production at the manufacturing plant or going through the shipping process).

The Reliability of Nuclear Weapons Databases

The United States and Russia currently provide the greatest degree of openness as far as information about their arsenals and corresponding nuclear development programs is concerned, including both official data and the large volume of information from the two powers' expert communities. This is primarily due to the decades of negotiations that Moscow and Washington have held on the SALT, START, and SORT treaties. By seeking to enhance the transparency and predictability of the two powers' strategic relations, these agreements foresaw an expanding exchange of information about the strategic forces of the two sides and their corresponding control regimes.

Of course, there have been occasional misunderstandings. For example, estimates of the state of the U.S. SNFs have varied in recent years because of the different methods used to count delivery vehicles and warheads under the START I Treaty and the Pentagon's newly proposed principle of "operationally deployed" weapons. This meant that for the first time in history, the status of Russia's SNFs was (until recently) even more open than that of the United States. The New START Treaty aims to reconcile these differences. On the whole, the level of openness between the two sides in a field as delicate and important as national defense has been unprecedented, of a sort that previously only applied to the closest military and political allies.

According to data published by the Pentagon on May 3, 2010, the total number of U.S. deployed and reserve strategic and non-strategic nuclear warheads was 5,113, with several thousand warheads awaiting dismantlement in storage facilities (according to some data, this figure stands at around 4,000 warheads.) The expert community estimates that the United States has about 2,700 nuclear warheads. About 2,200 of these are in service with the offensive strategic nuclear forces (SNFs), and 500 are with the tactical nuclear forces.¹ Every U.S. warhead represents the latest in thermonuclear weapon technology, with uranium and plutonium "triggers" and a yield of 10 to 500 kilotons.²

However, both parties are much more secretive about the number of their non-strategic nuclear warheads. The United States does not publish the number of tactical air bombs it has in storage in Europe and presents only a foggy picture of the number of sea-launched nuclear cruise missiles (SLCMs) its navy has in storage facilities and on bases. Russia has officially reported the number of tactical nuclear weapons of various designations that it has destroyed since 1991, but not the number or makeup of its available and planned weapons of this class. The U.S. expert community is much more likely to discuss this subject than are the Russian experts.

There is even less reliable data about the number of nuclear warheads that Russia has in central storage, where they are held at varying degrees of reserve readiness, or are waiting to be dismantled at their manufacturing plants. The dismantled warheads are either stored as weapons-grade nuclear material or used for civilian or military purposes (i.e., for new warheads). Russia does not reveal any information about these issues, and by and large even the Russian expert community does not discuss them.

At the official level, both France and Great Britain have been quite open about the status and development of their nuclear arsenals (both sea- and air-based), but while reporting the total number of deployed nuclear warheads, neither country publishes data about the actual number of warheads on deployed submarine-launched ballistic missiles (SLBMs). The discussion of these issues at the expert level in these countries is much narrower than it is in Russia, let alone the United States. Great Britain has been the most open of all the nuclear powers with regard to its stored nuclear warheads and materials, as it has been for the entire history of its nuclear weapons production.

The People's Republic of China has been completely closed in terms of official information available about its nuclear forces, as well as about its development programs and reserve capabilities. China has explained this by the need to protect its "nuclear deterrence" interests in light of its relatively "weak" strategic potential. Rather than factual information, Beijing issues numerous declarations about the "strictly defensive" nature of China's nuclear forces and the "minimal deterrence" principle behind its strategy. Most recently, a bit more information about the Chinese nuclear force alert configurations and operating concept has appeared at the unofficial level (sanctioned by the authorities, of course), but the reliability of this information is rather uncertain. In contrast to its extremely "modest" strategic declarations, at the October 1, 2009, military parade marking China's 60 year anniversary, China was clearly trying to make an international impression as a burgeoning military power, one with strategic nuclear arms. For obvious reasons there have been no free discussions of this subject by the country's expert community.

At the official level, India and Pakistan have remained as secretive about their nuclear forces and programs as China. At the same time, both nations devote a great deal of attention to the phrasing and nuances of their nuclear deterrence doctrines.

Israel does not publish any official data about its nuclear forces either, officially even refusing to consider itself a nuclear-weapon state. However, Israel has clearly also been trying to follow a line of "virtual nuclear deterrence" by encouraging unofficial discussion of its nuclear forces, systems, programs, and strategic concepts both inside the country and abroad.

North Korea has officially announced its involvement in both the testing and serial production of nuclear weapons, but for ob-

vious reasons it has not provided any statistical or technical data about them. Instead, Pyongyang has staged massive propaganda campaigns proclaiming the nation's readiness to give a "devastating response" to any "American imperialist aggression."

The "Nuclear Nine's" Forces, Programs, and Doctrines

In light of the above, the assessment of national nuclear arsenals and capabilities can be only partially based on official and reliable information. This applies even to the United States and Russia, to say nothing of the other nuclear-weapon powers. For the most part, the analysis of these issues ends up being based on isolated official statements and non-government research publications. These pieces are then compared and analyzed for authenticity, which was the method used for the survey below.

The United States currently has 450 Minutemen III ICBMs in its strategic forces. Each missile carries either one or three multiple re-entry vehicles for a grand total of 550 warheads.³ More than 90 percent of these are on constant alert and able to launch within a minute of the corresponding political decision being made at the top level. The triad's naval component consists of 14 Trident (Ohio class) SSBNs that can each carry 24 Trident II D5 ICBMs equipped with eight warheads each. (The United States does not officially list as strategic four submarines that it is currently refitting for conventional SLCMs with precision-guided warheads. Each of these can carry up to 154 missiles, for a total of 616 units). However, instead of reporting 432 missiles and 3,456 warheads as the START I counting rules suggest, Washington only reported one-third of that figure in an official 2009 data exchange with Russia. Neither does the United States account for two SSBNs that are undergoing major repairs at any given moment. Finally, each of the Trident II SLBMs are listed with four warheads rather than the eight they are believed to carry. Extending this number over 12 submarines, it would amount to 288 missiles and 1,152 warheads.

Eight U.S. SSBNs are stationed in the Pacific Ocean, while the other six patrol the Atlantic. Between 50 and 60 percent of this sea-based force (about 600 nuclear warheads) are on continuous combat status at sea, where they maintain high alert in readiness

to launch missiles upon receiving orders from the top political leadership. The United States is currently considering plans to reequip two of the 24 Trident II missiles on each of its SSBNs with three to four conventional multiple precision-guided warheads.

The air component consists of 93 B-52H and 21 B-2 heavy bombers, of which 44 and 16, respectively, are “operationally deployed” to carry 350 nuclear air-launched cruise missiles (ALCMs) and 150 air bombs. Under START I rules, these aircraft should be listed with 930 warheads. In addition, the United States has 67 B-1B bombers that have been re-equipped with conventional missiles and bombs. The United States has already removed its heavy bombers from high alert status (some of which had previously been kept fueled and loaded with combat ordinance), placing their nuclear bombs and missiles into Air Force storage facilities.

Differences between the START I counting rules and the “operational deployment” principle (which was the main stumbling block at the SORT and New START negotiations) apply to some 300 U.S. strategic delivery vehicles and 3,000 warheads. There is no such problem for Russia, since its stated figures under START I rules were already higher than its real capabilities. No matter what counting method is used, however, U.S. strategic nuclear forces are substantially smaller now (in numerical terms) than they had been in the late 1980s (around 12,000 warheads). They are also below the ceilings of START I (6,000 warheads and 1,600 delivery vehicles).

U.S. tactical nuclear weapons (TNWs) have undergone even more drastic cuts over the past two decades. Various expert estimates suggest that by the early 1990s, the United States had more than 11,000 such weapons, including around 7,000 in Europe and 1,000 in Asia. Currently, the United States has about 500 TNW, including 100 sea-launched Tomahawk missiles (TLAM-N) on board its nuclear-powered multi-purpose submarines and an additional 190 warheads for them, which have been deployed at various Navy bases across the United States. It also has 400 air bombs, 200 of which are stored at U.S. Air Force bases in five NATO countries (Belgium, Germany, Italy, the Netherlands, and Turkey). These bombs can be carried by U.S. Air Force F-16 fighter-bombers, by the Belgian and British fighter-bombers of similar type, or by the tactical fighter planes jointly developed by Germany and Italy. Official U.S. data have been extremely foggy on this subject.

The current U.S. nuclear forces development program does not provide for building new ballistic missiles, bombers, or strategic submarines. The technical service life of available Minutemen III has been extended until 2030, with some of them being refit to carry a single but more powerful (up to 600 kilotons) Mk-21/W-87 warhead from dismantled MX Peacekeeper ICBMs, rather than three multiple warheads. The United States also continues to produce modified Trident II SLBMs. These are meant to re-equip the Ohio class SSBNs, which will not be decommissioned until 2030-2040. The U.S. Air Force is also developing a new ECM air-launched cruise missile and is designing a bomber to potentially be commissioned after 2020.

U.S. Secretary of Defense Robert Gates recently reported that under the New START guidelines, the U.S. nuclear triad will comprise 420 Minutemen III ICBMs, 14 Ohio class SSBNs with 240 Trident II SLBMs, and up to 60 heavy bombers.⁴

As for its non-strategic nuclear forces, the United States decided to eliminate all of its Tomahawk nuclear SLCMs, but preserve and upgrade the B-61 air bombs. Conceivably, the new multipurpose F-35 tactical fighter could be certified to carry these bombs.

The possibility appears to remain that the United States could implement a Reliable Replacement Warhead (RRW) program (primarily for reequipping the Trident II) in exchange for its ratification of the Comprehensive Nuclear Test Ban Treaty (CTBT). The United States argues that in the absence of actual nuclear tests, it would need a reliable warhead of simpler design that would remain secure in the event of breakdown or illegal access (by terrorists, for example). However, although the production program for this new warhead had been intended to last decades, it would have clashed with President Barack Obama's declared interest in a nuclear-free world. The disposal of the warheads currently in storage and designated for decommissioning alone will take at least 12 years (the only facility for disposal of warheads in the United States, the Pantex plant in Texas, is capable of dismantling only 350 weapons annually.)

The latest version of the U.S. nuclear strategy was outlined in a report entitled the Nuclear Posture Review, published in April 2010. Essentially, this document presented the new nuclear doctrine of the United States as more closely reflecting the policies of the Obama administration.⁵

This document features substantial strategic innovations. Highlighting the need to preserve nuclear deterrence, the United

States de-emphasizes “the salience of nuclear weapons in international affairs” and resolves to cut its nuclear weapons. Washington’s security assurances for its allies will rest primarily on BMD and conventional weapons and armed forces. Acting in the interests of a nuclear-free world and countering nuclear proliferation and terrorism, the United States also intends to strengthen strategic stability, transparency, and mutual trust with China and Russia.

The new doctrine states that the “fundamental role of U.S. nuclear weapons, which will continue as long as nuclear weapons exist, is to deter nuclear attack on the United States, our allies, and partners.” The United States “would only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States and its allies and partners.” The role of nuclear weapons will be reduced in deterring attacks with conventional, chemical, and biological arms. The United States “will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the NPT and in compliance with their nuclear nonproliferation obligations.”⁶

However, this obligation does not extend to the nuclear-weapon powers and states that are in noncompliance with the NPT. It appears that, while implying its security guarantees to Japan and South Korea, the United States will maintain a nuclear deterrence option against an attack with conventional weapons or other types of WMDs “in a narrow range of contingencies.” Therefore, the United States is “not prepared ...to adopt a universal policy that the ‘sole purpose’ of U.S. nuclear weapons is to deter nuclear attack on the United States and our allies and partners, but will work to establish conditions under which such a policy could be safely adopted.”⁷

Despite all the qualifications that primarily deal with obligations to allies, Obama’s nuclear doctrine is unquestionably in marked contrast to those of the preceding administrations, moving to reduce the role of nuclear weapons in ensuring the security and foreign policy interests of the United States.

The Russian Federation was the second country of the world (after the United States) to become a nuclear power in 1949. At the moment, the Russian Federation has been even more open than the traditionally transparent United States, as far as official data on its strategic forces are concerned, which is to say nothing of the massive amount of information circulating through the expert community (the only exceptions here concern technical data

on nuclear warheads and the subject of SNF targeting assignments and operational plans.) Since Russia has never accepted the U.S. concept of “operational deployment,” it also lacks the same inconsistencies and uncertainties in its data. Russia’s thermonuclear warheads in design are similar to those of the United States; their yields are also similar, ranging from several kilotons to one megaton.

In 2009, the Russian strategic nuclear forces comprised 634 delivery vehicles and 2,825 nuclear warheads. The land-based missile force under the Russian Strategic Missile Forces (SMF) had 385 missile launchers and ICBMs carrying a total of 1,357 warheads; there were 68 SS-18 heavy ICBMs (with 10 multiple warheads each) in their launch silos, 72 SS-19 missiles (each carrying six warheads), and 180 ground-mobile vehicles equipped with launchers and single-warhead SS-25 Sickle missiles, as well as 50 SS-27 Sickle B silo-based (and 15 mobile-based) single-warhead ICBMs. As in the United States, 90 percent of all the forces have been on permanent alert, able to be launched within one minute of receiving the corresponding order from the country’s top leadership.

The sea component has 12 SSBNs and 208 submarine-launched ballistic missiles. The Northern Fleet has six Delta-IV submarines equipped with SS-N-23 missiles (each carrying four multiple warheads). The Pacific Fleet has five older Delta-III class nuclear submarines with SS-N-18 SLBMs (with three warheads each). These submarines carry a total of 176 missiles and 624 warheads. On average, between one and two submarines (with 60 to 100 warheads) are on combat patrol at any one time. However, some of the submarines that stay at their bases have traditionally also remained on constant alert for an on-the-spot launch. Moreover, one Typhoon class submarine is being used as a testing platform for the new SS-NX-30 SLBM, which means that the Typhoon is also being counted on the declared list of Russian SNFs as carrying 20 missiles. The one new *Dolgorukiy* class submarine is also counted, listed with 12 missiles (although the submarine itself remains stationed at the yard, and has not yet been equipped with the new SS-NX-30 systems it was designed for).

The strategic air component is comprised of 77 aircraft (63 Tu-95 turboprop heavy bombers and 14 Tu-160 Blackjack missile-armed bombers), which carry a total of 856 X-55 nuclear ALCMs.⁸

Russia’s non-strategic (or sub-strategic) nuclear forces are surrounded by even greater secrecy than those of the United States.

Some data suggest that at the moment, these forces have some 500 tactical nuclear air-launched missiles and bombs designed for the 120 Tu-22M medium bombers and the 400 Su-24 front-line bombers. In addition, they include about 300 air-launched missiles, air bombs and depth charges for the 180 Tu-22M, Su-24, Be-12, and Il-38 aircraft belonging to the Navy. More than five hundred of the TNWs are anti-ship, anti-submarine, and anti-aircraft missiles, depth bombs, and ship and submarine torpedoes, with 400 nuclear long-range SLCMs deployed on Russia's attack submarines. Around 100 nuclear warheads are listed as belonging to Moscow's BMD A-135 interceptor missiles, with 630 more on S-300 surface-to-air missiles and other tactical air defense territorial systems.⁹ According to representatives of Russia's military and political leadership, all of the Russian non-strategic nuclear weapons have already been placed in centralized storage, along with the SNF warheads. The total number is classified, but foreign experts estimate around 8,000 units.¹⁰

The Russian nuclear forces development plans publically available foresee in particular the continued deployment of a single-warhead SS-27s and the deployment of new SS-X-29 ICBMs (a multiple-warhead version of SS-27 for silos and ground-mobile launchers). A recent official announcement also stated that Russia planned to develop a new heavy silo-based ICBM. Somewhat earlier, in 2007 and 2008, a series of statements had suggested that Russia also wanted to create a new ICBM with "gliding, maneuverable supersonic warheads" that could penetrate any potential BMD.

The strategic relevance and cost effectiveness of either design leave plenty of unanswered questions. Most likely, they reflect an excess of prestigious motives and a shortage of systemic approach to nuclear deterrence issues at the highest political level, and are a product of lobbying by the defense industry and bureaucratic vested interests. All of the missions intended for these new systems can already be easily carried out by the solid-fuel SS-27 ICBM or the silo- and mobile-based SS-X-29 with single and multiple warheads. By resuming the Soviet tradition of running multiple parallel missile programs that ignore Russia's economic constraints, the country will only weaken its overall deterrence posture.

The Navy's main strategic program involves the construction of the new *Dolgorukiy* submarines. One of these has already been commissioned, and there are another two at various stages of construction. Their main problem has been the difficulty in developing

a new SS-NX-30 SLBM system (*Bulava*), which has had ten successful and seven failed tests. Thus, the new nuclear missile carrier has no missile to carry, and this has delayed the construction of the fourth SSBN. Previous generation submarines, however, are being deployed with the modified SS-N-23 *Sineva* SLBMs.

Russia is also continuing to build Tu-160 Air Force bombers (with a new aircraft coming off the production line every few years) and is developing a new ALCM system in both nuclear and conventional modes.

Unlike the United States, Russia does not disclose whether its strategic delivery vehicles carry new warheads or are still equipped with the old, tried-and-tested varieties.

The tactical systems are being upgraded through the deployment of *Iskander* tactical missiles, which can be equipped with either nuclear or conventional warheads. There is also a chance that the new Su-34 frontline bomber will also be dual purpose.

The future structure and scale of Russia's SNFs is being determined by the rate at which the old systems of the 1980s and 1990s are being decommissioned and by the scope of new deployments. Since these systems are being decommissioned much faster than they are being replaced, the SNF levels will continue to steadily decline over the coming decade and probably beyond. This means that the New START will have little impact on the Russian nuclear posture. For example, by 2020, Russia could have around 150 SS-27 Sickle B and SS-X-29 ICBMs, another 30 SS-19 missiles, three or four *Dolgorukiy* class SSBNs (which would carry between 44 and 60 SS-NX-30 SLBMs), and 40 to 50 Tu-160 and Tu-95 bombers, for a grand total of 300 delivery vehicles carrying 1,400 to 1,500 warheads (or 1,000 to 1,100 warheads, according to the New START counting rules). At the same time, the actual number of warheads could vary greatly, depending on the final number of warheads carried by the SS-X-29 and SS-NX-30 missiles.

Russia's current nuclear strategy was presented in the new Military Doctrine, which was published in February 2010.¹¹ This guideline document reads, in part: "The Russian Federation ensures the permanent readiness of the Armed Forces and other troops to deter and prevent military conflicts and provide armed protection of the Russian Federation and its allies in accordance with the norms of international law and the Russian Federation's international treaties. ...The prevention of a nuclear military conflict,

and likewise other military conflict, is the main goal of the Russian Federation.”

The procedure for using nuclear weapons was defined as follows: “The Russian Federation reserves the right to utilize nuclear weapons in response to the utilization of nuclear and other types of weapons of mass destruction against it and (or) its allies, and also in the event of aggression against the Russian Federation involving the use of conventional weapons when the very existence of the state is under threat.”

In other words, Russian nuclear forces are primarily designed to carry out a retaliatory strike against any adversary who attacks Russia and/or its allies with nuclear forces. Their second mission would be to deliver a first nuclear strike against any nation that uses chemical, biological, or radiological weapons to attack Russia and/or its allies, and the third envisions a first strike in the event of an impending national disaster resulting from an attack against Russia (but not its allies) involving conventional forces and weapons. This last point is apparently aimed at addressing the threat arising from the expansion of NATO (which has been establishing superiority in both general purpose forces and precision-guided conventional weapons), and the likely dangers of the changing strategic situation in the East, which has not been evolving to the favor of the Russian Federation.

When comparing this document to the previous Russian Military Doctrine of 2000, what is notable is the more restrained and conservative interpretation given to Russia’s potential first use of nuclear weapons in the event of a conventional weapons attack. Previously, Russia would have used these weapons “in response to large-scale aggression and the use of conventional weapons in situations that are critical to the national security of the Russian Federation.”¹² Now, this involves situations “when the very existence of the state is under threat.” Moving on, but this time keeping in line with the preceding document, the new Doctrine sets the combat objectives of nuclear forces as “the infliction of the required damage on the aggressor whatever the conditions of the situation.”

It is telling that the new Doctrine avoids any mention of the “innovations” it had tried over its first decade, particularly the plan to “de-escalate aggression ...with the threat of delivering or directly carrying out strikes of various scale involving the use of conventional and (or) nuclear means of destruction.” Also missing is the concept of “the selective combat use of the individual components of the Strategic

Deterrence Forces,” and demonstrations of resolve by “heightening the level of their combat readiness, conducting training, and changing the stationing of their individual components.”¹³ Perhaps they remain buried in Russia’s secret documents that outline the use of nuclear weapons in cases when “the very existence of the state is under threat.” However, their absence from the country’s main document on military policy and buildup alters the thrust of Russia’s nuclear posture and eases any military or political pressure it was meant to provide.

Therefore, despite the **focus of various political declarations on nuclear weapons** as the backbone of Russian security, the new Military Doctrine generally expresses a more restrained view of the objectives and role of nuclear weapons. Moreover, this restraint is obvious in comparison with not only Russia’s previous Doctrine, but also the nuclear strategic concepts of France, NATO, the United States, and other nuclear-weapon states.

France, with its 108 delivery vehicles and about 300 warheads (although in official sources the latter figure is given only approximately), is the world’s third-largest nation in terms of total numbers of strategic nuclear weapons. France tested its first nuclear weapon in 1960, and now has thermonuclear warheads of 100 to 300 kilotons in service.

The backbone of the French forces are three *Triumphant* class SSBNs, which carry 48 M45 missiles and 240 warheads, and one *Inflexible* class submarine of a previous design. At any given moment, one of these submarines is undergoing maintenance while another patrols at sea. Curiously, in order to save funds, France only maintains enough SLBMs to **equip its operationally deployed missile submarines** (which, in this case, consists of three submarines). Additionally, the French Strike Forces include 60 *Mirage 2000N* and 24 *Super Etendard* carrier-based fighter-bombers, which are capable of delivering about 60 air-to-ground missiles. France has no other nuclear weapon systems.

France’s modernization program provides for the commissioning of a fourth *Triumphant* class submarine (in place of the last *Inflexible*, which is being decommissioned) and the deployment of new extended range M51.1 SLBMs. It also provides for the introduction of a next generation aircraft (the *Rafale* class fighter). The aviation component of France’s SNFs would be considered tactical in nature under the U.S.-Russian manner of classification, but it is included as part of France’s strategic Strike Forces. In 2009, Paris announced

plans to slash its aviation component in half, which would reduce the numbers of its strategic nuclear forces to about 100 delivery vehicles and 250 warheads.

With its relatively small nuclear potential, France openly stresses its reliance on a distinctly offensive nuclear strategy, one that includes the first-strike option and the use of either massive or limited force against traditional opponents and “rogue states,” and, more recently, even China (the new extended range SLBM is being created with these very missions in mind.)

At the same time, to be fair, it must be noted that France is also the only country in history to have unilaterally destroyed all of its land-based missiles: both the medium range *Pluton* missiles and the short-range *Hades* systems. France has also lowered the alert status of its Strike Forces, although details remain vague. France stopped producing uranium in 1992 and plutonium in 1994. It has also dismantled its fissile material production facilities (and invited foreign observers to verify this) and closed its nuclear test site in Polynesia. France has further announced a one-third cut in its nuclear arsenal and introduced a ceiling of 300 nuclear warheads for its entire nuclear forces.

Great Britain is more open about its nuclear posture. Its first nuclear weapon was tested in 1952. Currently, British thermonuclear warheads have yields of around 100 kilotons. Great Britain might also have some sub-kiloton warheads.

The country's strategic forces comprise four Vanguard class submarines carrying 48 U.S.-made Trident II SLBMs, and 140 British-made nuclear warheads. The British SLBMs are intended for just three of the submarines, since the fourth is under maintenance at any given moment, just as in France. Great Britain also has 10 reserve missiles and 40 warheads in storage. There have been unofficial reports suggesting that some of the SLBMs carry a single small warhead and are targeted at “rogue states.” Great Britain has no other nuclear forces.

After some heated debate, in the middle of the present decade the British decided to design a new class of SLBM for the planned purchase of a modified U.S. Trident II missile. Great Britain also made plans to develop a new class of nuclear warheads after 2024 (the slated retirement date of the Vanguard submarines). It is entirely possible that the pace of nuclear cuts undertaken by the United States and Russia under the New START and any subsequent agree-

ments will prompt Great Britain to reconsider these plans.

While preserving the option of delivering limited nuclear strikes against “rogue states,” Great Britain has not overemphasized its reliance on nuclear weapons, adhering instead to the strategy of “minimal nuclear deterrence.” For example, London has officially declared that its nuclear forces are on low alert, and that they would need additional time to prepare for use upon receiving the appropriate orders from the top command. However, Great Britain has provided no technical explanations as to what exactly this involves.

The United Kingdom has declared its entire fissile material stockpile, and has also placed fissile materials that are no longer needed for military purposes under international IAEA safeguards. In addition, it has opened its enrichment and processing facilities to international IAEA inspections and begun to put together a historical ledger of all fissile materials it had produced in the past. It is also conducting an experience-building program in nuclear weapons reduction and destruction checks. For example, in 2004, the third session of the Preparatory Committee of the 2005 NPT Review Conference agreed to investigate whether or not the technology control regime could also be used for decommissioned weapons.

The People’s Republic of China conducted its first nuclear test in 1964. At the moment, China is the only permanent UN Security Council member and the only one of five Parties to the Treaty on the Nonproliferation of Nuclear Weapons legally recognized as nuclear powers that discloses no official armed forces data, leaving its nuclear forces completely under wraps.

Officially, this secrecy is justified as follows: since China has a numerically inferior nuclear force that cannot compare in technical capability to those of the other members of the “nuclear five,” it needs to preserve SNF secrecy in order to maintain its deterrence potential. At the same time, China is the only great power to have officially endorsed the no-first-strike policy; moreover, it has done so without any reservations. This promise has been accompanied by a few vague unofficial explanations (which are probably sanctioned by the authorities) to the effect that in time of peace, China keeps its nuclear warheads separate from its missiles. These unofficial sources further explain that in the case of a nuclear attack, these warheads would be loaded into delivery vehicles, and a retaliatory strike would be delivered against the aggressor within two weeks. If this really is the case, it may be explained by the fact that China lacks the technol-

ogy to reliably prevent the unsanctioned use of their nuclear weapons (similarly, the United States and the Soviet Union had also kept their warheads separate from their delivery vehicles in the 1950s.)

Conventional wisdom dictates that any nuclear-weapon power that renounces the first-strike option must rely on the concept and capabilities of a retaliatory (second) attack. However, experts now agree that China's strategic nuclear forces, along with its missile warning system (MWS) and command and communication infrastructure, would be too vulnerable to respond to a hypothetical disarming strike from the United States or Russia.

Thus, China's official doctrine has primarily been interpreted as being a political propaganda weapon (similar to the Soviet Union's 1982 commitment to the no-first-use principle) that does not reflect the real purpose of China's strategic nuclear forces, which are designed for preemptive strike. However, the programs for modernizing the Chinese nuclear forces will soon objectively increase the survivability of its second strike potential if its early warning system and the command and control systems survive, and if improved security systems to prevent the unsanctioned use of nuclear weapons continue to be developed as well (which would allow the system of storing delivery vehicles and warheads separately to be abandoned). With a survivable early warning system and heavily protected combat control units, China would not only be able to deliver a retaliatory attack but would also be able to ensure that there would be no unsanctioned use of its nuclear weapons (which would also permit China to keep its warheads and delivery vehicles together).

In light of the completely sealed nature of China's official data, any nuclear assessments must rely only on data from foreign governments and private sources, according to some of which China has around 130 strategic nuclear ballistic missiles. These include 37 old fixed-site *Dong Feng 4/5A* ICBMs and 17 old fixed-site *Dong Feng 3A* medium-range ballistic missiles (IRBMs). China has also deployed about 20 new ground-mobile vehicles equipped with *Dong Feng 31A* ICBMs (which is the Chinese analogue of Russia's SS-25 *Topol*) and 60 new ground-mobile vehicles equipped with *Dong Feng 21* IRBMs.¹⁴ (Other data suggest that China has 12 *Dong Feng 31/31As* and 71 *Dong Feng 21/21A* IRBMs.¹⁵) Each of the above-mentioned missiles carries a single warhead.

China is also developing a new multiple-warhead ICBM, the *Dong Feng 41* (with six to 10 warheads), planned for ground-mobile and

rail-mobile launchers (similar to the decommissioned Russian SS-24 ICBMs). China has also occasionally sent on duty the experimental *Xia* nuclear submarine (which has 12 *Julang* SLBM missile launchers) and is constructing a second *Jin* class submarine with extended range *Julang 2* missiles. Its aviation component, meanwhile, consists of 20 outdated medium-range *Hong 6* bombers, copied from Soviet Tu-4 aircraft produced in the 1950s.

Although Beijing denies having sub-strategic nuclear weapons, some estimates show that China has around 100 such systems: 48 *Dong Feng 15/15A* mobile tactical missiles and 48 *Dong Feng 11/11A* mobile tactical missiles. China is also deploying *Dong Feng 10* ground-launched and air-launched cruise missiles (GLCMs and ALCMs), which are meant for its medium *Hong 6* bombers. The country's approximately 40 nuclear air bombs are also designed for this aircraft. Its tactical attack aircraft (which can also carry nuclear bombs) consist of front-line *Qian-5* bombers and new attack aircraft based on Russian Su-30 and Su-35 technology.

In all, the Chinese nuclear arsenal is thought to include around 180 to 240 warheads, which (depending on the unofficial data's accuracy) ranks it together with France at third and fourth place (after the United States and the Russian Federation). China is believed to have primarily thermonuclear weapons in the 200 kiloton to 3.3 megaton range.

There is no question that China's economic and technological potential could allow it to rapidly build up the full range of its nuclear missile weapons. If it made the corresponding political decision, China could deploy between 200-250 missiles and 1,200-2,500 warheads within 10 years by using its multiple-warhead *Dong Feng 41* mobile ICBM as a base. These SNFs would not only be highly survivable (in other words, capable of delivering a retaliatory strike), but also be able to penetrate a likely BMD system and have a significant potential to deliver a disarming strike against any nuclear-weapon state (except for the United States). China has also been taking steps to improve the survivability and effectiveness of its land- and space-based early warning systems and command and control systems.

China is the only nation besides the United States and the Russian Federation that has such a large potential to build up its strategic nuclear forces so quickly. This dictates the need to include China's nuclear forces (or to ensure their transparency and limits) in any

U.S.-Russian strategic arms reduction discussions that follow the New START.

Israel, unlike any other nuclear-weapon power, not only fails to report its official nuclear posture data but also refuses to even confirm that it has a nuclear force. Nevertheless, none of the world's private or public expert communities question that Israel does have nuclear weapons. Quite intentionally, Tel Aviv has never disputed this view. Similar to the U.S. position on its ship- and submarine-launched nuclear weapons in Japan, Israel pursues a nuclear deterrence strategy of "neither confirmation nor denial."

According to the country's leadership, Israel's officially unrecognized nuclear posture presents a fairly tangible deterrent to the surrounding Islamic states. At the same time, it also tries to avoid aggravating the uncomfortable position of United States with regard to its military and political support to Israel. The Israeli leadership apparently feels that open admission of the fact that it has nuclear weapons could provoke the surrounding Arab nations to withdraw from the NPT and create their own nuclear weapons.

It appears that Israel first succeeded in developing a nuclear weapon in the late 1960s. Israeli warheads are based on weapons-grade plutonium, and although they have never undergone field tests, no one doubts their battle worthiness in light of the high scientific and technical qualifications of the Israeli nuclear researchers and their foreign assistants.

According to expert estimates, Israel's nuclear arsenal currently consists of 60 to 200 nuclear weapons of various types. Around 50 of these were built for Israel's 50 Jericho II medium-range (1,500 to 1,800 kilometers) ballistic missiles. Their range is long enough to reach throughout the Middle East, over Iran, the Caucasus, and southern Russia. In 2008, Israel tested a 4,800-6,500 kilometer Jericho II, which falls into the intercontinental class of missile. Israel's remaining nuclear warheads are probably air bombs that can be dropped by attack aircraft (in particular, over 200 U.S.-made F-16s and some other aircraft types). In addition, Israel recently purchased three Dolphin class diesel-electric submarines from Germany and placed an order for two more. **The torpedo tubes on these submarines** were apparently designed to launch the tactical Harpoon class SLCMs (with a range of up to 600 kilometers) that Israel acquired from the United States, which can attack ground targets with both conventional and nuclear warheads.

Although for obvious reasons, Israel never explains its nuclear doctrine, it clearly retains the first-strike option (a preventive or pre-emptive strike). After all, based on the logic reflected in the words of the Russian Military Doctrine, it is intended to prevent the occurrence of situations in which “the very existence of the state is under threat.” Throughout the course of the 60 years of Middle Eastern wars and to the present day, Israel has known nothing but victory, achieved by exclusively conventional means. However, these victories were becoming more and more difficult with each new campaign, and were inflicting ever greater losses on Israel. It would appear that Tel Aviv has concluded that the Israeli army will not be able to count on such victories forever, especially considering the nation’s vulnerable geostrategic location, the much greater populations in the surrounding Islamic nations, their more numerous armed forces, and the rates at which they have been acquiring modern weapons, not to mention their official declarations appealing “to erase Israel from the political map of the world.”

However, recent trends could call into question Israel’s national security strategy. In the event of continued proliferation of nuclear arms (in particular, through their acquisition by Iran and other Islamic states) Israel’s nuclear deterrence would be neutralized by the nuclear capabilities of the other regional states. This could result in Israel’s catastrophic defeat in a future conventional war, or lead to an even greater disaster as a consequence of regional nuclear warfare. In the meantime, there is also little doubt that Israel’s “anonymous” nuclear potential poses a serious stumbling block to the consolidation of the nuclear weapons nonproliferation regime in the broader Middle East region.

India, like Israel and Pakistan, falls into the category of a nuclear-weapon nation not having legal nuclear power status under Article IX of the NPT. New Delhi does not report official data about either its nuclear forces or its programs. Most experts estimate India’s nuclear capabilities at about 60 to 100 weapons-grade plutonium warheads. These can be deployed on either the corresponding number of single-warhead *Prithvi I* tactical missiles (with a range of up to 150 kilometers), *Agni I/II* short-range missiles (with ranges of between 700 and 1,000 kilometers), and *Agni III* medium-range ballistic missiles (with a range of up to 3,000 kilometers); the latter are still under development. The *Agni IV* medium-range missile, having a range of up to 3500 kilometers, was tested on November

15, 2011; and the *Agni V*, with a range of up to 5000 kilometers, was tested on April 19, 2012. India is also testing two short-range sea-launched ballistic missiles called *Dhanush*. India's strike aircraft *Mirage 2000H* and Jaguar S(I) can apparently also serve as nuclear bomb carriers, as can the MiG-27 and Su-30MKI fighter-bombers that India acquired from Russia. The latter two are capable of being refueled in flight by Russian-made Il-78 aircraft.

After its first nuclear test in 1974, which it declared to have been for peaceful purposes, India openly conducted a nuclear weapon test in 1998, proclaiming its nuclear forces to be a deterrent against China. However, like China, India also accepted the obligation not to be the first to use nuclear weapons, making an exception only in the case of attacks against India involving other types of WMDs. The available information suggests that India also, like China, keeps its nuclear warheads separated from their delivery vehicles.

Pakistan conducted its first nuclear weapon test in 1998. The test was almost simultaneous with India's, and had the officially stated goal of deterring the latter. However, the timing of these tests suggested that Pakistan had been developing nuclear weapons over many decades, perhaps starting with India's "peaceful" nuclear test of 1974. In the absence of any official information, Pakistan's nuclear arsenal has been estimated to have more than 60 enriched-uranium warheads ranging from the sub-kiloton level to 50 kilotons.

Pakistan uses two types of tactical ballistic missiles as delivery vehicles – the 400 to 450-kilometer range *Hatf III Ghaznavi* and the *Hatf IV Shaheen I*, as well as the 1,200-kilometer *Hatf V Ghauri* MRBM and the 2,000 *Haft VI Shaheen II* MRBM. Pakistan is testing the *Ghauri III* IRBMs, as well as ground-launched cruise missiles (*Hatf VII Babur* and *Hatf VIII Raad*).

Pakistan's likely aviation delivery means include U.S.-made F-16 A/B fighter-bombers, French-made *Mirage V*, and Chinese-made *Qian 5* (A 5).

Pakistan's tactical missiles have been moved to positions on its border near India (with India's missiles also capable of reaching Pakistan). Its medium-range systems cover nearly all of India, Central Asia, and Western Siberia.

Pakistan's official nuclear strategy openly relies on the first-use option (preventive nuclear strike). This policy refers to India's superiority in general purpose forces (which is what Russia also has done in reference to the United States, NATO, and, in the future,

China). Nevertheless, according to available data, Pakistan, like India, keeps its nuclear warheads separate from their delivery vehicles, which indicates that Pakistan's nuclear deterrence would be dependent upon timely warning of an impending war with India.

This separate storage is of tremendous importance in Pakistan's case in light of its unstable domestic political environment, the strong influence of Islamic fundamentalism (including in the officer corps), and its suspected involvement in terrorist activities in Afghanistan. Another important factor is the clandestine transfer of nuclear materials and technology onto the world's "black market" through the network set up by A.Q. Khan.

North Korea presents a rather curious special case from a legal point of view in terms of its nuclear status.

From the standpoint of international law, the five great powers (all members of the NPT) have been legally recognized as "nuclear-weapon states" (Article IX). Three other de facto nuclear-weapon nations (India, Israel, and Pakistan) are recognized as such in the political sense alone; having never subscribed to the NPT, they are not legally nuclear-weapon powers, nor can they join the Treaty as nuclear-weapon powers for the reasons set forth in that very same Article IX.¹⁶

North Korea came to represent a completely new category of nations, those with an unrecognized nuclear status. The fact of the matter is that North Korea used the benefits of peaceful nuclear cooperation with other nations under the NPT for military purposes. The accompanying violation of Treaty articles concerning cooperation with the IAEA led to North Korea's ultimate withdrawal from the NPT in 2003, which it did in violation of Treaty's Article X on withdrawal terms. Therefore, recognition of North Korea's nuclear status would be tantamount to the abetment of its flagrant violation of international law and a dangerous precedent for other potential violators.

Nevertheless, North Korea tested two plutonium nuclear devices, one in 2006 and another in 2009, and now has about five or six nuclear warheads, according to experts. It is believed, however, that these warheads are too large to place on either missiles or delivery aircraft. Once they have been sufficiently upgraded, North Korea could theoretically deploy them on hundreds of short-range *Hwasong* class missiles or several dozen *Nodong* class MRBMs. Between 2007 and 2012, North Korea also conducted unsuccessful tests on a new *Taepodong* ICBM.

North Korea's *Hwasong* missiles with nuclear warheads can reach South Korea, the neighboring regions of China and Russia's Primorye Region, which includes Vladivostok. The medium-range *Nodong* missiles can also reach central China, Japan, and Siberia. The successful development of the intercontinental *Taepodong* missile, meanwhile, could allow these ICBMs to reach Alaska, Hawaii, and the West Coast of the United States. They could also potentially hit targets throughout Asia, European Russia, and even Central/Eastern and Western Europe.

Current Weapons Development

Unlike the situation during the Cold War era, the current state of military and political relations between the nuclear-weapon powers can hardly be described as an "arms race." The rates and scope of nuclear system development and deployment are incomparably lower today. The contest has shifted from being distinctly bilateral to being multilateral. Its participants often follow asymmetric courses that involve no direct system-to-system competition (except between India and Pakistan).

Apart from the existing nuclear capabilities of the nine nuclear-weapon powers listed hierarchically above, the current nuclear weapons modernization and development programs can be arranged as follows:

Russia, which even according to official data is simultaneously conducting research, development, and deployment of three types of ICBMs (the SS-27 Sickle B, the SS-X-29,¹⁷ and the new "heavy" missile) and a gliding warhead that can penetrate BMD defenses, belongs in first place. There are three *Dolgorukiy* class SSBNs and two SLBM systems (the SS-N-23 and the SS-NX-30) at various stages of construction for the Russian Navy. The Air Force, meanwhile, has been continuing to purchase Tu-160 class heavy bombers and is developing a new ALCM. It is also considering building a new heavy bomber. In the meantime, Russia has also been deploying tactical missiles like the *Iskander* and, potentially, other TNW delivery systems.

In reality, however, the rates of Russian SNF modernization have been extremely low (10 to 12 strategic missiles per year and one heavy bomber every few years; the first SSBN of the new class has been under construction for more than a decade.) Russia must also

try to compensate for at least some of the SNF cuts due to the decommissioning of hundreds of systems that were deployed in simultaneous large series from the 1970s through the 1990s. Even with that in mind, the multiplicity of these programs still appears unjustified, considering the much smaller size of Russia's military budget compared to that of NATO or China and the vast need for it to modernize its general purpose forces (GPF), not to mention the other requirements of military reform.

China, which is either deploying or developing three types of strategic ballistic missiles (the *Dong Feng 31* and *Dong Feng 41* ICBM, and the *Dong Feng 41* IRBM), follows the Russian Federation in second place. It is also building a new *Jin* class SSBN and developing a new SLBM system (the *Julang 2*) and an entire package of various tactical nuclear systems. At the same time, it must be noted that China's rate of deploying nuclear weapons is still extremely slow, even compared to Russia. Besides, China is upgrading its capabilities beginning from a very "low starting point" (for the moment, it is primarily replacing and adding to a handful of outdated systems.)

Third and fourth place in the multilateral nuclear contest appear to be shared jointly by India and Pakistan, which have simultaneously been testing new intermediate- and medium-range ground-launched ballistic missiles (one in India, two in Pakistan), sea-launched tactical ballistic missiles (two in India), and ground-, sea- and air-launched cruise missiles (one in Pakistan, but in three modifications). At the same time, the deployment rates of these nuclear missiles remain low (only a few complexes per year). Submarines and attack aircraft are either being licensed or purchased abroad in large orders, with several dozen aircraft purchased at a time.

Fifth place in this rating belongs to France (which is building a new *Triomphant* SSBN and developing both an M51.1 SLBM and a new *Rafale* tactical fighter system), followed in sixth place by Great Britain (which is engaged in the long-term design of new strategic submarines, is purchasing modified Trident II SLBMs, and is developing new warheads for these submarines).

Seventh place is held by Israel and its "undeclared nuclear capability." Israel has been testing a new IRBM/ICBM system (Jericho II) and is deploying a foreign-bought tactical naval missile system (SLCM) that could potentially deliver nuclear arms.

Eighth place may be provisionally given to North Korea, with its

“boutique” nuclear warhead production and intercontinental ballistic missile tests.

As strange as it may sound, despite having the most powerful deployed nuclear capabilities (at least in terms of strategic weapons), the United States stands last among the nine nuclear-weapon powers, both in terms of scope and rates of nuclear weapons development. A string of six successive decades has been broken by a unique interval during which Washington has not commissioned a single new nuclear weapon. Washington’s activity in this field has been limited to extending the terms of existing weapons. However, it has also been modernizing and modifying existing systems and weapons (which includes the “unloading” of warheads from ICBMs and SLBMs, **replacing multiple-warhead missiles with more powerful single-warhead ones**, and retrofitting submarines, bombers, and, most likely, ballistic missiles for delivering non-nuclear munitions). In addition, Washington has been developing a new type of ALCM, the ECM air-launched cruise missile.

At the same time, Washington has been pouring enormous resources into the improvement of command and control systems (including those based in space). It is also improving the performance of weapon components, changes that steadily upgrade the SNFs’ nuclear capabilities despite the rounds of quantitative arms cuts. Moreover, the United States has also been developing an entirely new range of conventional strategic offensive and defensive systems.

Washington’s future plans include the design of a new generation of heavy bombers and cruise missiles. The Obama administration may also have to pay the price of ratifying the START and CTBT treaties by launching the Reliable Replacement Warhead (RRW) program (and perhaps even developing a sub-kiloton deep penetrating warhead to be used against hardened targets).

Nuclear Strategies of the Main Players

Despite the vast diversity among the doctrines and strategic concepts of the nuclear-weapon powers, the differences in their approaches to propaganda, and the varying degrees to which they reflect their true nuclear intent, they can nevertheless be systemized. For example, the conditions under which the use of nuclear arms would be seen as justified can be broken down as follows:

For a retaliatory (second) strike:

- Each nuclear-weapon power is prepared to use nuclear weapons to respond to a nuclear attack on their territory.
- The United States and Russia are prepared to resort to nuclear weapons in the event that their allies have come under attack by nuclear weapons.

For the first-use option:

- France, India, (certainly) Israel, Russia, and the United States, are all prepared to use nuclear weapons first to retaliate against an attack against them using other types of WMDs.
- Russia and the United States are prepared to use nuclear weapons in the event of an attack on their allies using other types of WMDs. The new U.S. military doctrine, which was published in April 2010, does not provide for the use of nuclear weapons in the event of such attacks against itself or its allies (except for Japan, which fears this form of aggression from North Korea).
- Pakistan, Russia, and probably Israel would be prepared to use nuclear weapons if facing the threat of catastrophic defeat in a war in which the adversary had used conventional military forces and weapons exclusively.
- France, Great Britain, and, until 2010, the United States (within the framework of the NATO strategy) have allowed for the possibility of using nuclear weapons if this would prevent the defeat of their general purpose forces. The new U.S. military doctrine does not provide for the use of nuclear weapons in such cases.
- All of the powers except for China and India by default allow for the possibility of using nuclear weapons in a pre-emptive strike to destroy a threshold nation's missiles or other WMD delivery vehicles.
- The United States had previously sanctioned the selective use of nuclear weapons against terrorist facilities and in other situations, depending on the circumstances. However, the new military doctrine does not mention this point.
- Russia may use nuclear weapons to retaliate against conventional weapon strikes against its strategic forces, early warning systems, state administration locations, nuclear or

other critically dangerous and important facilities, or against vitally important industrial facilities or infrastructure.

- Russia has allowed for the possibility of using its nuclear weapons to demonstrate its resolve and “de-escalate aggression” (at least, that is what Russia declared at the turn of the decade.)

In all cases, the targets would be located within the territory of either the potential adversary or its allied states (especially if they have deployed the adversary’s nuclear weapons). Other potential targets would include the adversary’s bases and forces deployed abroad.

The willingness of the powers to use nuclear weapons first would depend on whether they see such weapons primarily as a deterrent or as a tool of actual warfare and a means of achieving military success (whatever that term might mean). The first-use option is more than nuclear deterrence, or, at the very least, it represents a rather broad interpretation of what deterrence is. Unlike the deterrence capability, which provides for a retaliatory nuclear strike, the first-strike option is usually associated with the strategy of launching a disarming (or counterforce) strike. The first-strike option can also be viewed as a necessity in countering an adversary’s superior general purpose forces, or to head off an adversary’s disarming strike.

Arranging the powers in terms of their preparedness to make a first strike with nuclear weapons, and then based on their official doctrines, likely planning scenarios, and objective geostrategic situations, yields the following picture:

The most offensive postures (in which the first-use option plays the primary role) have been assumed by Israel and Pakistan, as may be seen from their strategic needs, technical characteristics, and force composition and structures.

Second place under this criterion would appear to belong to Russia. Its relative offensive nuclear strength compared to that of hypothetical opponents such as China, NATO, and the U.S.-Japanese alliance will decrease in the future. However, Russia’s current lag in GPFs and advanced nuclear weapons and its regional vulnerability will all create incentives to resort to the first-use concept.

Third place would provisionally be held by the United States. In light of its objective situation and military capability, it has no serious incentive to be the first to use nuclear force. However, its doctrinal provisions, obligations to its allies, and vast superiority

in counterforce nuclear capabilities have ensured that the United States would retain the first-use option in its new 2010 doctrine.

Next would be India, which has promised not to use nuclear weapons first. While it will continue trying to maintain the ability to deliver a disarming strike against Pakistan, it will also remain vulnerable to a counterforce strike by China.

Fifth place may be assigned to China. It has declared and unambiguously accepted the obligation not to use nuclear weapons first. However, in the face of the superior forces of the United States and Russia, China's second-strike capability (which corresponds to its official declaration) at present looks meager at best. With time, however, China will unquestionably gain such an ability against both the United States and the Russian Federation. It may also eventually improve its offensive (counterforce) SNF capabilities against India and, in the future, perhaps even Russia.

Sixth place would belong to France, whose doctrine fairly aggressively stresses the first-strike option, but whose nuclear forces and geostrategic location (in the heart of NATO) actually provide for neither the need nor the ability to adopt this nuclear posture.

Great Britain, which only a few years ago had seriously entertained the thought of completely abandoning not only the first-strike option, but nuclear arms in general, would be in last place. While it has a position and potential similar to those of France, London (unlike Paris) gives only the vaguest of interpretations of the first-strike option, seeing no need for it, yet not wanting to complicate matters politically with NATO or the United States.

Finally, North Korea still cannot be placed into this ranking because it has probably not yet created nuclear warheads compact enough to be delivered by missiles or combat aircraft. Its potential may rather be characterized as "provocative" or "subversive" in nature (in other words, one in which weapons could be delivered by such unconventional means as aboard civilian ships or aircraft).

There is little question that all of the nuclear-weapon powers consider nuclear weapons to be a useful and irreplaceable pillar and shield for both their own security and that of their allies. They also view them as being attributes of special standing and political influence in the world. Each one of them can present arguments in favor of having them that appear "irrefutable," at least from their own perspective. At the same time, any presumptions by other nations to acquire nuclear weapons are treated as dangerous, unacceptable and unjustified.

This means that not only did the end of the Cold War fail to diminish the inequality between the nuclear-weapon and non-nuclear-weapon states, it actually aggravated and legalized it. Instead of being raised, the “nuclear thresholds” (or critical levels at which nuclear weapons may be used) expressed in the military doctrines of the majority of these powers have been only lowered, and none of these countries is considering abandoning the nuclear first-strike concept, to say nothing of nuclear deterrence as a whole.

With the coming of the Obama administration, the goal of ultimate nuclear disarmament proclaimed in Article VI of the NPT returned to the official pronouncements of the United States. It also reemerged in the joint documents signed with Russia, as well as in Russia’s own top-level declarations. The two parties entered into intense dialogue that ended with the signing of the New START Treaty and with the introduction of amendments to their respective nuclear doctrines. However, for the time being, this appears to be more of a revival of political ritual and a shift in declarations than a real realignment of strategy and nuclear weapon development programs toward a steady reduction in the role of nuclear weapons in national and international security.

NOTES

- 1 See: *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers* (Canberra, 2009).
- 2 T. Cohran, W. Arkin, R. Norris, and J. Sands, *U.S. Forces and Capabilities*, vol. 1 (Cambridge, 1984), PP. 82-87.
- 3 *SIPRI Yearbook 2009. Armaments, Disarmament and International Security* (Oxford University Press, 2009), PP. 346-353.
- 4 R. Gates, “The Case for the New START Treaty,” *Wall Street Journal*, May 13, 2010.
- 5 *The Nuclear Posture Review Report*, (Washington, D.C., April, 2010).
- 6 Ibid, P. viii.
- 7 Ibid.
- 8 A.G. Arbatov, *The Security Equation* (Moscow, 2010).
- 9 *SIPRI Yearbook 2008. Armaments, Disarmament and International Security* (Oxford University Press, 2008), PP. 373-375.
- 10 *Eliminating Nuclear Threats*, P. 20.
- 11 “The Military Doctrine of the Russian Federation,” *Gazeta*, Feb. 25, 2010.

- 12 "The Military Doctrine of the Russian Federation," *Nezavisimaya Gazeta*, Apr. 22, 2000.
- 13 *Urgent Objectives for Developing the Armed Forces of the Russian Federation* (Moscow: The Ministry of Defense, 2003), P. 42.
- 14 *SIPRI Yearbook 2009*.
- 15 M. Bildanov and A. Anufriyev, "A Bet on Reprisal Strikes," *National Defense* 45, no.12 (Dec. 2009): PP. 32-35.
- 16 According to Item 3 of Article IX, a "nuclear-weapon State" is one that manufactured and detonated a nuclear weapon or other nuclear explosive before January 1, 1967.
- 17 These two systems are nearly identical, differing only in their warheads (the former has a single warhead, while the latter is MIRVed.) Since Russia has officially declared the second missile to be a separate system and given it a name of its own, however, there are reasons to qualify it as such.

Part II

**The Proliferation of Nuclear
Weapons**

CHAPTER 3

NUCLEAR ENERGY PROSPECTS ¹

Peter Topychkanov

The Current State of Nuclear Energy

Alternative energy sources and nuclear energy have been topics for discussion for some time now, fueled by lobbyists representing various branches of the energy sector. This was evidenced during the run-up to the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change in Copenhagen in 2009 (which is generally considered to have been a failure),² when concern was expressed over the influence of the defense industry and energy sector on the political institutions and non-governmental organizations involved in discussing energy issues and climate change.³

The current series of discussions was precipitated by increasing energy consumption, high prices,⁴ finite reserves of the main energy sources (hydrocarbons), and a worsening environmental situation. The U.S. Department of Energy has calculated that global energy consumption could rise from 149 million GW-hours in 2010 to 174.6 million GW-hours in 2020 and 198.8 million GW-hours in 2030 (an increase of 25.1 percent). The annual increase in energy consumption could come to 1.5 percent. The highest annual increases over 2010-2030 are expected in China (3.2 percent), Brazil (2.6 percent) and India (2.5 percent).⁵

At the same time, according to the International Energy Agency's (IEA) 2009 basic development forecast of global energy markets to the year 2030 (assuming that governments do not change their energy policies), coal, gas, and oil are predicted to remain the primary energy sources around the world. Under this forecast, oil is expected to retain the lead as the world's primary energy source, although its share will drop from 34 percent of global demand in 2008 to 30 percent in 2030. Global demand for gas, coal, and renewable energy sources is predicted to increase.

The point needs to be made that limited hydrocarbon supplies do not imply an “energy famine” looming in the next century, even if the basic forecast proves to be correct. Along with the growing energy demand, proven energy reserves will also increase. Between 1989 and 2009, for example, proven oil reserves increased by 24.5 percent (from 1006 to 1333 billion barrels). Taking oil-bearing sands into consideration (the commercial exploitation of which is only a matter of time), oil reserves would come to 1476 billion barrels.⁶ Proven reserves of natural gas have increased by an even greater amount (34.7 percent), from 122 trillion cubic meters to 187 trillion cubic meters.⁷ Technological advances make projects to develop previously unprofitable or inaccessible deposits (such as shale gas deposits) increasingly attractive.

The IEA predicts that the total capacity of hydroelectricity and nuclear energy will increase, although their overall share in the global energy balance will fall. The share of nuclear energy could decrease from 14 percent (2010) to 10 percent (2030).⁸ The basic IEA forecast anticipates that the global economy will become more dependent on hydrocarbons, bringing about serious consequences for the climate and energy security.

Emissions of greenhouse gases resulting from human activity and causing climate change could rise from 28.8 gigatons in 2007 to 40.2 gigatons in 2030, which would cause average global temperatures to rise by as much as 6°C.⁹ This would have disastrous consequences in the form of dramatically decreased harvests (by a third in Africa) and rising ocean levels, which could leave London, Shanghai, New York, Tokyo, and other cities underwater.¹⁰

An alternative IEA scenario called Scenario 450 postulates collective action to reduce the concentration of greenhouse gases to 450 particles per million of CO₂ equivalent, which would mean that CO₂ emissions resulting from human activity would reach a peak in the second decade of the century and then begin to decrease to a figure of 26.4 gigatons in 2030. This scenario aims to confine the rise in global temperatures to no more than 2°C.

This scenario could be implemented with the right combination of political and economic instruments (in particular hydrocarbon market instruments), sector-based agreements, and national programs adapted to the conditions of specific countries and regions. Among the measures essential for implementing Scenario 450 are a more efficient use of energy, expansion of the share of renewable

energy (to as much as 37 percent of electric power production by 2030) and nuclear energy (to 18 percent), and the development and use of energy saving and environmentally friendly technologies (especially carbon dioxide capture and burial).¹¹ The IEA estimates that implementation of this scenario would require as much as 10.5 trillion dollars of investment in various economic sectors.¹²

The International Atomic Energy Agency has also suggested two development scenarios for the nuclear energy sector. Under the first, the share of nuclear energy in the overall energy balance would decline from 14 percent in 2010 to 13 percent in 2030. Under the second, the share of nuclear energy would rise to 16 percent. Under both scenarios, the amount of electricity produced by nuclear power plants (NPPs) is predicted to increase (by 27 percent and 53 percent, respectively).¹³

From Nuclear Renaissance to Fukushima

The notion of a “nuclear renaissance” became popular at the turn of the present century, reflecting the increasing interest in nuclear energy in response to the factors outlined above.¹⁴ The United States began to reconsider nuclear energy after a hiatus of almost 30 years during which not a single reactor had been built. It is currently building one power reactor (1.7 percent of the total number of such reactors in the world), has nine more planned (6 percent), and has proposed designs for 22 (6.4 percent).

Currently (mid-2012), there are 435 power reactors in operation around the world, 61 are under construction, another 162 have been planned, and project plans have been proposed for another 329 total.¹⁵ Once the reactors already under construction and those planned to be built have been commissioned, nuclear power plant capacity could increase by a total of 35 percent over the next decade (from 370 GW in 2010 to 500 GW in 2020).¹⁶

However, the question of whether there will be any substantial increase in nuclear energy’s share in the global energy balance remains an open one. Hans-Holger Rogner, head of the IAEA’s planning and economic studies section, does not anticipate any substantial increase. In his opinion, the share of nuclear energy can be expected to decrease by 2030, due in particular to the amount of time it takes

to build nuclear energy facilities, the shortage of nuclear engineers, and continued public fears of nuclear disaster.¹⁷

A 2009 study by the Massachusetts Institute of Technology examined in detail the obstacles in the way of a “nuclear renaissance.” They include the rising costs of nuclear energy projects, security issues, and the problems of nuclear storage and nuclear nonproliferation.¹⁸ The threats associated with nuclear energy are well known: emission of radioactive substances, irradiation of NPP personnel and residents of other regions during reactor accidents or breakdowns, leakage from radioactive waste storage facilities, and the fact that peaceful nuclear energy development, especially in the nuclear fuel cycle, can raise the risk of the proliferation of nuclear weapons.¹⁹

Over the first decade of this century, nuclear energy has not become competitive with hydrocarbons. This is due to the high cost of technical equipment for nuclear facilities (75 percent of the cost in nuclear energy as opposed to 6 percent and 22 percent respectively in the gas and coal sectors). Moreover, the cost of building NPPs rose by 15 percent over this period (construction costs of energy facilities using hydrocarbons also rose over the same period, but at a slower rate.) One of the factors contributing to the high costs involved in nuclear energy facilities is the high risks that investors encounter: nuclear energy projects very frequently do not proceed according to their timetable, and may even end up frozen.

The prospects for nuclear energy have also been negatively impacted by the global financial crisis that began in 2008. Global energy consumption declined in 2009 for the first time since 1982,²⁰ and conservative investment policies became prevalent. Under such conditions, governments can have an important part to play in nuclear energy development by minimizing the risks of investing in nuclear industry projects.

This situation has been affected by the Fukushima Daiichi disaster in Japan (2011). Many countries have already reconsidered their nuclear energy development plans, opting to limit or even discontinue them (e.g., Germany); other countries have not changed their plans so dramatically because they are interested in expanding their exports of nuclear power (France and Russia), or need the nuclear energy due to a lack of reserves of hydrocarbons of their own (India and Pakistan), or the intention to develop nuclear energy in order to conserve their stocks of oil and gas (Russia and the United States). Numerous countries responded to the Fukushima Daiichi

disaster by reviewing safety measures at their nuclear plants and/or by improving standards of safety and resistance to natural disasters (Britain, Canada, China, France, India, Japan, Russia, South Korea, Spain, Sweden, Switzerland, and the United States). Some countries, however, did not review either their nuclear energy development plans or their safety standards (Argentina, Brazil, Iran, North Korea, and South Africa).²¹

Table 1.
Responses to the Fukushima Daiichi Disaster by Country

Country	Safety reviews of existing plants	Safety standards reviews	Other significant decisions
Argentina	-	-	
Brazil	-	-	
Canada	+	+	
China	+	+	
France	+	-	
Germany	+	+	Shutdown of the 7 oldest plants, moratorium on lifetime prolongation
Great Britain	+	-	
India	+	-	
Japan	+	+	
Russia	+	-	
South Africa	-	-	
South Korea	+	-	
Spain	+	-	
Sweden	+	-	
Switzerland	+	+	
United States	+	+/-	

Source: *Impact of Fukushima Event on Nuclear Power Sector: Preliminary Assessment* (Paris: Areva, 2011), P. 8.

There are a number of countries interested in the development of nuclear technologies, such as Bangladesh, Egypt, Jordan,

Myanmar, the Philippines, Saudi Arabia, Turkey, and the United Arab Emirates. Five of these states are located in that part of the Middle East where serious political turmoil in early 2011 resulted in the end of the long-reigning regimes in Egypt and Tunisia, accompanied by a wave of violence throughout the region.

Of greatest concern is Iran, which is pursuing the development of nuclear technologies with a military potential. Its policies could provoke nuclear proliferation in the region. According to the International Institute for Strategic Studies, Iran has obtained more than 2,800 kg of low-enriched uranium (LEU) as a result of the processing complex at Natanz, which operates 4800 centrifuges (of 8400 centrifuges installed). In 2009, an additional Enrichment Center that Iran had not reported to the IAEA was discovered in the city of Qom.

The growing number of countries possessing nuclear dual-use technologies is representative of a new type of virtual nuclear proliferation. Without creating nuclear weapons or leaving the NPT, a country could stop the development of nuclear technologies at the nuclear threshold, retaining enough material and technologies for a rapid transition to a nuclear military program.

Challenges and Responses

Many countries remain extremely cautious about nuclear energy, especially in light of its impact on security, the nuclear, radiation and environmental dangers, and also the risk of nuclear proliferation. If suitable technological and political-legal solutions to these problems are not found, this could create even greater threats to international security than a shortage of energy would pose to global economic growth. The inadequate safety standards at nuclear energy facilities in an ever growing number of countries could lead to environmental disasters greater in scale and socio-economic costs than greenhouse gas emissions. Some leading countries have already learned this from their own experience.

Current nuclear energy security standards and the nuclear weapons nonproliferation regime in its present state will not be sufficient to prevent these kinds of risks. Urgent and radical measures will be needed to strengthen the nonproliferation regime, all of its mechanisms and institutions, and all of its provisions (including Article VI), along with extensive additional measures of a legal,

financial and economic, and scientific and technological nature, to ensure an acceptable level of nuclear energy security today and in the future.

According to academician Nikolay Ponomaryov-Stepnoy, such measures could include, for example, developing international nuclear fuel cycle centers, global remote monitoring of nuclear materials, real-time computerized accounting and control systems in all declared areas of nuclear activity, and quantitative analysis of proliferation risks, including categorizing nuclear materials and technology, analysis of volumes and flows of dangerous nuclear materials in circulation at all stages of the nuclear fuel cycle, collection of data on the quantities of fissile materials in storage facilities, and regulation of the handling of radioactive fission products and actinides based on the danger that they could be used by terrorists to create a “dirty bomb.”²²

The threat of terrorism makes it essential to improve security standards at all nuclear installations that could be of interest to terrorists, including NPPs, nuclear fuel cycle installations, spent nuclear fuel storage facilities, and vehicles used to transport nuclear materials. The attack on the Baksan Hydroelectric Station in Russia on July 21, 2010, served to demonstrate that terrorists are prepared to carry out attacks that would cause massive destruction, given that the consequences of destroying hydroelectric or thermal power stations and nuclear power plants would be comparable to using a weapon of mass destruction and could cause huge loss of life.²³

The Western countries and Russia, fearing nuclear terrorism, have introduced border controls to detect attempts to illicitly transport radioactive materials, but control over the transport of nuclear materials is non-existent in most other countries, including in the “failed” states, into which nuclear materials could be smuggled for the purpose of making a nuclear explosive device. Thus, as the international nuclear cooperation network develops, new weak links may yet emerge that could be vulnerable to criminals unless much more stringent measures are implemented to control and protect the transport of nuclear materials.

* * *

Nuclear energy is an irreplaceable component of the long-term measures needed to achieve the transformation of the global energy system that is so crucial to preventing a worsening environmental situation, supporting more evenly distributed global development,

and strengthening energy security at the national, regional and global levels. This transformation will be possible only if all countries take urgent and coordinated action. In the nuclear energy sector, international cooperation based on a common set of rules must focus on the following tasks: raising mandatory nuclear safety standards, strengthening the nuclear nonproliferation regime at the technological, political and legal levels, and ensuring fair conditions for all responsible countries that have an interest in nuclear energy. If the entire international community makes a common effort to resolve these issues, it would indeed usher in a “nuclear renaissance.”

NOTES

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CHAPTER 4

THE IRANIAN PROBLEM

Anton Khlopkov

Iran has long held an abiding interest in the use of nuclear power. The practical implementation of this aspiration began in the late 1950s and has continued unevenly over the last 50 years. Depending on the economic circumstances and political situation both in the country and abroad, its development passed through several stages of acceleration (in the second half of the 1970s, for example, and the 1990s) and stagnation (such as during the first half of the Iran-Iraq War of 1980-1988). Iran is also known to have been pursuing nuclear research of an applied military nature while it has simultaneously been developing its nuclear power industry.

Iran's Interest in Nuclear Power: a 50-Year History

Iranian diplomats have been monitoring nuclear research development progress around the world since the 1940s. In 1947-1948, for example, Amir Abbas Hoveyda, Iran's consul-general in Stuttgart, West Germany (and later prime minister of the country from 1965 to 1977), expressed an interest in Nazi Germany's nuclear program. Relying on publicly available information and a series of personal meetings, he compiled a report for the Iranian Ministry of Foreign Affairs detailing the history of the German program to develop a new super-weapon.¹ On January 11, 1954, Iran's Ambassador to India, Ali Asghar Hekmat, wired his government that both India and Pakistan had evinced an interest in developing nuclear technology.² In 1957, the Embassy of Iran in Jordan informed its Ministry of Foreign Affairs that according to local media reports, Israel had established an institute for preparing nuclear specialists.

In response, the Iranian minister of foreign affairs, Ali Gholi Ardalan, sent instructions to the country's embassies around the world that they carefully monitor the development and use of nuclear power and report their findings to the government.³ At about the same time, the country initiated a program of practical development to establish the scientific and technical base required for the use of nuclear power, primarily by establishing cooperative relationships in the field internationally.

The Western nations that had become the key trading, economic, and political partners of Iran under the Shah did much to stimulate the interest of the Shah and his circle of leading industrialists in the use of nuclear power, attempting to draw the petrodollar-rich nation into investing in the development of the new power sector. In 1974, for example, the United States offered to open its own nuclear industry to Iranian investment (in connection with which U.S. Atomic Energy Commission chief Dixy Lee Ray visited Tehran in May 1974). In 1976, France was able to reach an agreement with Iran for a one-billion-dollar investment into its national nuclear industry, while Great Britain considered the possibility of using Iranian financial assistance for a "technological turnaround" by redirecting the nation's nuclear power development program to the use of light water rather than gas-cooled reactors. It was also Iranian funds that were greatly responsible for saving the Eurodif international uranium enrichment consortium following the withdrawal of Sweden in 1974 (Iran agreed to "take its place" in the project.)

In March 1974, Shah Mohammed Reza Pahlavi of Iran announced his plan for nuclear power development to the year 1994 that included constructing more than 20 nuclear power reactors with a total power generation capacity of 23 GW, as well as developing a closed nuclear fuel cycle in order to obtain uranium enrichment capacities and spent nuclear fuel reprocessing technologies. By that time, nuclear power was to provide a third of Iran's total electric power generation capacity, which was to increase from 5 to 70 GW. In 1975, about 80 percent of the electric power in Iran was generated by thermal power plants and about 20 percent by hydroelectric power stations.⁴

Iran saw its key partners in implementing its nuclear power development plans as being primarily the nations of the Western bloc, and in the latter half of the 1970s it signed contracts with Canada, France, and West Germany, initialed a deal with the United States, and began negotiations with Australia and Great Britain. During

the initial stage it was planned that Iran would focus on building light water reactors, because, in the first place, they were commercially the most widely used reactors at the time; second, they had acquitted themselves well in both the United States and a number of countries in Europe; and third, this reactor type had the greatest number of suppliers.⁵

Heeding the advice of its foreign advisors, Iran also expressed an interest in such fast breeder reactors as the French-produced Phoenix, which offers the opportunity to reproduce nuclear materials. After India tested a nuclear device in May 1974, Iran began to express an interest in acquiring a Canadian heavy water CANDU reactor.⁶

The country's leadership decided to cover its initial uranium isotope separation needs by purchasing shares in foreign companies. The United States saw Iran over the long term as a potential exporter of uranium enrichment services.⁷

The decision to develop nuclear power was made by the Shah of Iran personally, and was initially discussed only with the country's prime minister, Amir Abbas Hoveyda, who had also supported this approach to the energy sector development. The government was not initially involved in the discussions.⁸ The ministers were called on to discuss the nuclear power issue for the first time when it became necessary to draft a new law on nuclear power in order to establish the new Atomic Energy Organization of Iran (AEOI), and to define its structure, functions, and methods of control over its activities. The draft law made the AEOI responsible directly to the Shah of Iran, with the roles of government and parliament limited to debating and approving an annual budget for the organization. The law passed with minor revisions and was approved by both chambers of parliament in mid-May 1974.⁹

The Shah's Iran and Nuclear Proliferation

The first head of the AEOI, Akbar Etemad, met regularly with the Shah to discuss matters relating to implementation of the nuclear power development plan. These meetings became especially frequent between 1974 and 1976. According to his memoirs, during one of these meetings Etemad asked the Shah directly, "What do you expect of me? Are you thinking of building a bomb?" Reza Pahlavi

replied by describing Iran's strategic position and the need to maintain an uninterrupted flow of oil in the Persian Gulf and the Indian Ocean. In light of Iran's predominance in conventional weapons over the other states in the region (with the exception of the Soviet Union), the Shah said that he saw no need to begin the production of nuclear weapons at that time. It would be a premature decision that would only set the Western nations against Iran, and could also potentially impede the supply of technology that Iran needed in order to implement its nuclear power development program. At the same time, the Shah noted that if the situation should change over the next 10, 15, or 20 years and this or that country should acquire a nuclear weapon, then Iran would have to reconsider its position and make nuclear weapons a priority. Etemad said that it was after this discussion that he issued the order to establish a group of scientists to which "no doors would be closed."¹⁰

It was probably at this time that Iran set the acquisition of a "nuclear ability" as one of its goals (in other words, acquisition of the scientific, technological, and material resources needed to create a nuclear weapon). According to former Iranian Foreign Affairs Minister Ardeshir Zahedi (who had signed the Nuclear Non-proliferation Treaty on behalf of Iran in 1968), they felt that if Iran should make the political decision to proceed, it must have everything it would need to build a nuclear weapon within 18 months.¹¹

The United States first detected undeclared Iranian nuclear activity relating to the extraction of plutonium and the laser enrichment of uranium around the mid-1970s.¹² In the December 1975 U.S. Central Intelligence Agency report "Managing Nuclear Proliferation: The Politics of Limited Choice," Iran was listed as one of the "threshold states" that could conceivably "graduate to nuclear explosives" and were "likely to be able and willing" to do so "by or before 1985."¹³

Another document, the Special National Intelligence Estimate "Prospects for Further Proliferation of Nuclear Weapons," which was written in August 1974 and declassified in the 2000s, concluded that "there is no doubt ...of the Shah's ambition to make Iran a power to be reckoned with. If he is alive in the mid-1980s, if Iran has a full-fledged nuclear power industry and all the facilities necessary for nuclear weapons, and if other countries have proceeded with weapons development, we have no doubt that Iran will follow suit."¹⁴

Acknowledging the fact that Iran has relied on both foreign technology and a foreign workforce for the development of its nuclear power

industry, a report by the U.S. Congressional Office of Technology Assessment¹⁵ expressed the concern that the leadership in Iran might also be seeking to hire foreign bomb designers on a mercenary basis, particularly in light of the multimillion-dollar profits that the country was earning from the export of oil. At the same time, the report cited a lack of available information concerning the Shah's true intentions or plans in the nuclear sector.¹⁶

It is possible that the latter estimate had been based upon information on Iranian-Israeli cooperation in nuclear and missile technology. One of these joint projects, "Tzur" ("Flower"), launched in 1975, provided for joint Iranian-Israeli development of a new "ultra-modern missile" that could carry a 750-kilogram payload¹⁷ and be capable of delivering a nuclear warhead.¹⁸ Under the agreement on cooperation, Israel was to be responsible for developing and manufacturing the delivery vehicles, while Iran was to finance the project. Also, there was some information that Israel and Iran were cooperating in a joint uranium enrichment project, with South Africa providing technological support.¹⁹

The accelerated development of the nuclear fuel cycle (NFC) in Iran and the ability of the Shah's regime to establish ties internationally in the sensitive areas of the nuclear fuel cycle (uranium enrichment and reprocessing of spent nuclear fuel) provoked the concern of the Soviet Union, which in October 1976 objected to French plans to supply Iran with a plant for radio-chemical reprocessing of the spent nuclear fuel.²⁰

Iran's Nuclear Program Following the Islamic Revolution

Initially, the new leadership that came to power in Iran as a result of the 1979 Islamic Revolution evinced no interest in a nuclear program. On the one hand, this was a consequence of the economic crisis in the country at the time and the fact that there were other priorities to be addressed, and on the other hand it was due to the break in diplomatic relations with the United States and the chill in relations with other nations that had previously helped Iran to pursue nuclear research. Moreover, the large-scale emigration of scientists that followed the Islamic Revolution diminished the nation's scientific, technological, and material capabilities in the nuclear sec-

tor. For example, only eight staff members remained of the previous 120 at the University of Tehran's chemistry and physics departments (which housed the country's most advanced nuclear research center).²¹ Iran found its ability to fund nuclear activities even more limited following the attack on its territory by the Iraqi army on September 22, 1980, and the onset of the Iran-Iraq War.

However, as combat operations continued on the front lines of the Iran-Iraq war, Iran gradually began to reconsider its position on investing in enterprises dealing with high technology, including those in the nuclear sector. This was primarily due to the fact that both superpowers (the United States and the Soviet Union) were supporting Baghdad, and this included frequent shipments of advanced weaponry. This compelled the Iranian leadership to pursue self-sufficiency in the key areas of national security. Secondly, Iran seemed stunned by the "unpunished" use of chemical weapons by Iraqi troops, which the rest of the world met with what amounted to tacit agreement.²² In 1982, speaker of the Iranian *Majlis*, Hashemi Rafsanjani, declared that Iran needed to achieve "technological independence." Soon thereafter, the Iranian parliament passed a law stipulating that property confiscated during the revolution would be returned to the nuclear scientists who were willing to return from emigration to Iran.

After Iran's efforts to restore relations with its original European partners ended in utter failure in the late 1980s, the AEOI began an intense search for contacts among the countries not as developed in the nuclear field, primarily China and Pakistan, but also North Korea.

In 1987, Iran and Pakistan agreed to cooperate in the area of centrifuge uranium enrichment. In subsequent years, Iran was supplied with detailed drawings of the components of the P-1 centrifuges and their assembly, specifications for manufacturing the components and centrifuge assemblies, and the technical documentation on output capacities of the centrifuges, as well as drawings of the centrifuge cascades used for research purposes and the ancillary equipment for their operation. These shipments from Pakistan allowed Iran to assemble 500 P-1 centrifuges as early as 1995.²³ Pakistan's assistance came through an illegal network set up by the leading scientist of Pakistan's nuclear weapons program, Abul Qadeer Khan.

Some data suggest that Iran had also relied on expert assistance from North Korea during the second half of the 1990s in putting

the acquired centrifuge equipment and technology into operation.²⁴ It cannot be discounted that the development was carried out in North Korea with the participation of Iranian specialists and financed by Iran. The two countries that were pursuing missile development had already employed a similar scheme previously. Iran had funded the development of a new modified Scud B missile in North Korea under the condition that Iran be supplied with a significant number of these weapons.²⁵ It is noteworthy that information about the centrifuge enrichment programs of North Korea and Iran appeared at about the same time (in August and December 2002, respectively).²⁶

With help from China, the AEOI was able to make progress in a number of the technical processes that precede uranium enrichment, in particular, the production of uranium hexafluoride (the conversion of uranium into gaseous form). China also provided Iran with a certain quantity of natural uranium in various forms, some of which was later used to test centrifuges and their cascades. These materials were not provided to Iran under IAEA safeguards. At the time these deliveries were made, China was not subject to any export control restrictions, since it was not then a party to the Nuclear Non-proliferation Treaty, the Zangger Committee, or the Nuclear Suppliers Group (NSG).

At the beginning of the 1990s, Iran also began to actively engage the countries of the former Soviet Union in an effort to obtain technology, material, and expertise relating to the nuclear fuel cycle, including the areas of uranium mining and enrichment. In spite of the fact that the protocol of negotiations signed in January 1995 between Minister of the Russian Federation for Atomic Energy Victor Mikhailov and AEOI President Reza Amrollahi had included potential cooperation between the two countries in these areas, Russia by that point had already made the political decision to limit its involvement in Iran to completing the construction of the 1,000 MW power reactor in Bushehr that German specialists had begun in the 1970s and training the personnel to operate the facility safely. Iranian attempts to establish relationships with Russian institutes directly, thus bypassing the Ministry for Atomic Energy and Russian export control laws, met with limited success.

Aside from these efforts, in order to illegally acquire dual-use technology and associated equipment in the 1990s, Iran also began to rely actively on a supply network that had been formed in Europe and had already proven itself by successfully supplying conventional weapons during the Iran-Iraq War.²⁷ Iran also tried to make use of its strong

diaspora presence in most of the developed countries of the world (including Canada, Germany, Great Britain, and the United States) in order to obtain know-how and expertise in the high technology areas in which it was interested. In 2005, Iranian nationals living in the United States were arrested for attempting to ship computers, satellite communications equipment, and other technology to the Islamic Republic illegally.²⁸

The Crisis Surrounding the Iranian Nuclear Program: From Negotiations to Sanctions

The general outlines of the process that Iran had followed in the nuclear sector over the 1980s-1990s emerged only in 2003-2004, when the IAEA began investigating some undeclared Iranian activities that had come to light in 2002. It soon became clear that Iran had advanced much further in the development of the front-end of the nuclear fuel cycle (including uranium enrichment) than had been generally thought.

This had been facilitated by Iran's initial willingness to cooperate, for example, by allowing IAEA inspectors to visit previously undeclared sites. A favorable atmosphere for attempting to resolve the crisis was established by the December 2003 signing of and temporary compliance with the Additional Protocol to the IAEA Safeguards Agreement by Iran, and its acceptance of the modified text of Code 3.1, which required it to inform the IAEA about the construction of new facilities as soon as a decision to build them has been made. There was also positive parallel movement in the dialogue between the European troika of intermediaries (France, Germany, and Great Britain) and Iran.

However, the preference of the George W. Bush administration for using pressure, isolation, and sanctions against Iran to win concessions in the uranium enrichment question and its unwillingness to compromise became yet another obstacle to finding a resolution to the crisis. It became the primary goal of the U.S. administration to punish Iran for conducting nuclear activities not declared to the IAEA, rather than to establish an environment that would be conducive to the investigation of such activity by the IAEA.

Washington missed a unique opportunity to improve the situation markedly and to establish a qualitatively new level of trust

between the United States and Iran (which would have probably influenced Iran's nuclear program, as well) shortly before the disclosure of undeclared activities in Iran (in the end of 2001 and the beginning of 2002), when the moderate government of Iran was providing considerable support to the anti-terrorist coalition's activities in Afghanistan and repeatedly signaled its desire to normalize relations with the United States. These signals remained unheard by the Bush administration, and in January 2002, the United States included Iran in the "axis of evil."²⁹

At the beginning of the process of crisis resolution surrounding the Iranian nuclear program, the uncompromisingly hard line followed by the Bush administration was largely responsible for the consensus that formed among the Iranian scientific, technological, and political elites to support the idea of developing the nuclear fuel cycle in the country. Meanwhile, the idea of nuclear power had gained the essentially unanimous support of the Iranian people.

Another factor of significance during the stalemate in negotiations to resolve the crisis was the major defeat suffered by the liberal and reformist forces in Iran's June 2005 presidential elections. Iran's position at negotiations with the European troika and IAEA became even less accommodating following the election of conservative candidate Mahmoud Ahmadinejad. One of the new president's first decisions was to resume uranium conversion at Isfahan, which had been suspended under agreements with Great Britain, Germany, and France. By so doing, Ahmadinejad sent a clear signal that his country was choosing a new, more aggressive political course for its nuclear program,³⁰ one it has continued to follow for the past five years.

The collapse soon thereafter of the efforts by the troika of European intermediaries and the fruitless restructuring of the dialogue into the "P5+1" format (with Germany joining the five permanent members of the United Nations in June 2006) led to the imposition of sanctions in an effort to resolve the crisis. Earlier, in September 2005, the IAEA Board of Governors had adopted a resolution accusing Iran of violating the Safeguards Agreement of May 15, 1974.³¹

In July 2006, the UN Security Council adopted Resolution 1696, which threatened to take action under Article 41, Chapter VII of the United Nations Charter if Iran failed to comply with its requirements. The IAEA also issued its demands, primarily that Iran halt its uranium enrichment activities.³² After Iran failed to comply with the Resolution's requirements, the UN Security Council

adopted a series of successive “sanctions resolutions,” each of which noted a lack of progress in Iran’s compliance with the preceding resolution.

UN Security Council Resolution 1737 (2006)³³ prohibited shipment of any equipment or technology to Iran that could be used either for uranium enrichment or for reprocessing of spent nuclear fuel. It also froze the bank accounts of Iranian companies implicated in illegally acquiring nuclear technology abroad. The Resolution further obliged the UN member states to inform the UN Security Council’s Special Committee if any Iranian individuals associated with nuclear activities crossed their borders.³⁴ Resolution 1747 (2007)³⁵ expanded the list of sanctions that had initially been introduced in December 2006 in Resolution 1737; in particular, the new resolution prohibited Iran from exporting weapons.

UN Security Council Resolution 1803 (2008)³⁶ reaffirmed the provisions of the preceding resolutions and appealed to all nations (in accordance with their national regulations and laws and with international law) to carry out inspections of cargo arriving at their airports and seaports belonging to certain Iranian companies suspected of transporting equipment and materials used for undeclared nuclear activities. Resolution 1835 (2008)³⁷ reaffirmed the resolve held by the UN Security Council member states to compel Iran to comply with the previous Resolutions.

Iran has not recognized the legitimacy of the sanctions adopted by the UN Security Council and continues to ignore their provisions on uranium enrichment almost five years after the first resolution was adopted. According to former Iranian Foreign Affairs Minister Mottaki, the sanctions were “illegal, useless, and unjustified,” and Iran’s nuclear program is “entirely peaceful.”³⁸ Against this backdrop, Iran has also called for reform of the current format of the UN Security Council, arguing that it does not reflect the present situation in the world.³⁹

The Obama Administration and Iran’s Nuclear Program

The transition of power at the White House and beginning of the Obama administration led to an adjustment of U.S. foreign policy. Washington began to assign greater priority to diplomacy and

negotiations rather than to pressure and threats of the use of force. The new U.S. administration signaled its readiness to engage in direct dialogue with Iran, and the new U.S. president addressed the leaders and people of Iran in a video message in March 2009. However, the crisis of trust that has existed between the two sides continues to the present day to prevent advantage being taken of this “window of opportunity” for resolving the situation with the Iranian nuclear program that had opened following Barack Obama’s election as president. A new obstacle in the search for a resolution has arisen with the deterioration of the domestic political situation in Iran following the June 2009 presidential election, the results of which, according to opposition candidates, were falsified.

The September 2009 discovery of yet one more uranium enrichment facility under construction in Iran, this one near the city of Qom (based on IAEA data, the facility was designed for 3,000 centrifuges and could have been completed by 2011) dealt another blow to the nuclear confidence-building process.⁴⁰

Admittedly, a potential solution to the crisis did appear to be within reach on October 1, 2009, when the secretary of Iran’s Supreme National Security Council, Saeed Jalili, met in Geneva with the political directors of the P5+1 and Javier Solana, the EU high representative for foreign affairs and security policy. The parties emerged with Iran agreeing to send 75 percent of its low-enriched uranium (LEU) out of the country in exchange for the P5+1’s promise to produce fuel from that LEU for the Tehran Research Reactor.

On October 21, IAEA experts proposed an arrangement for how this would actually work. According to this plan, 75 percent of Iran’s LEU (some 1,200 kilograms) accumulated at the enrichment facility in Natanz was to be shipped to Russia by January 15, 2010. The uranium hexafluoride would then undergo purification and enrichment at one of the existing facilities in Russia (which has an overall separation capacity comprising 40-45 percent of the total global capacity), where there is enough spare capacity to accept and fulfill Iran’s order expeditiously.

Subsequently, the 19.75-percent enriched uranium was to be shipped to France (the technology to produce nuclear fuel for the Tehran reactor is currently available only in Argentina and France), where it would then be made into fuel for the Tehran reactor and shipped back to Iran through Russia by the end of 2010.⁴¹ The entire project was to be carried out on a commercial basis.

On the one hand, this meant that if the project had been implemented, Iran would have thus received fresh nuclear fuel for the Tehran Research Reactor, the operation of which otherwise would have had to have been either curtailed or halted altogether within months. Iran would have had the opportunity to improve the effectiveness of reactor use for research projects and isotope production, primarily for medical purposes. This would have also served as indirect acknowledgement by the Western members of the P5+1 group of Iran's right to enrich uranium and recognition of the achievements that Iranian scientists have made in the development of the nuclear fuel cycle. Finally, it would have presented an opportunity for restoring confidence in the non-military nature of Iran's nuclear program, a confidence that has once again been undermined with the discovery of the nuclear activities near Qom that had not been declared to the IAEA.

On the other hand, the shipment of low-enriched uranium hexafluoride out of Iran would have removed the concerns among the Western P5+1 countries that Iran might shift the low-enriched uranium it had produced to the manufacture of a nuclear explosive device within a short period of time, and would have relieved some of the urgency Iran felt in accelerating construction of the Nuclear Research Center in Arak based on the IR-40 Heavy Water Reactor, which according to AEOI representatives is being built as a replacement for the obsolescent Tehran reactor. The agreement would have provided the P5+1 nations with additional arguments in favor of using a political and diplomatic approach to find a resolution to the crisis, a standpoint that had become increasingly difficult to defend following the discovery of the site in the Qom area.

On October 23, France, Russia, and the United States agreed to the Agency's draft. Several weeks later, Iran informed the IAEA that it also remained interested in the proposal. However, it did express its reservations, noting that certain points required major revision. In particular, Iran insisted that the low-enriched uranium must be shipped out of the country in individual lots. When the Western nations refused to consider its counterproposals, the leadership in Iran declared that it had begun independently enriching uranium to the 19.75 percent level, thus escalating the situation and turning up the heat in the crisis.

To summarize, it can be said that in keeping with the development of nuclear power for the best interests of the state, Iran's goals

have remained essentially the same since the 1970s, when they were first formulated by the Shah's regime. Together with diversification of the sources of electric power for the country, the development of nuclear technology has also been meant to provide Iran with scientific, technological, and material resources that could be used for creating nuclear weapons if the political decision were made. At the same time, there is no reliable information suggesting that the leadership in Iran has made the political decision to create nuclear weapons.

It may be assumed that Iran is continuing to rely heavily on foreign assistance in order to master nuclear technology. The progress achieved by Iranian scientists has obviously given the country much more independence in its efforts and research than it had in the 1970s. It appears that Iran has also maintained the format of intergovernmental cooperative ties that it had established under the Shah for Iranian participation in the nuclear sector. Iran pays for such projects in cash or, more often, in oil, relying on both the technological base and expertise of its partner in return.

At the same time, Iran has also considerably reduced the transparency of its nuclear and dual-use material purchases compared to the 1970s. With limited opportunities for acquiring nuclear and related technologies and material on the world market, Iran has begun actively utilizing the potential of the black market and non-governmental players, which have made it possible for Iran to obtain not only the technology and equipment it needs for civilian nuclear projects, but also materials that might have application in the military use of nuclear power (the IAEA, for example, has received information from various sources about work being conducted in Iran on detonators and documents in its possession that might be related to a spherical implosion system.)⁴² Another distinctive feature of Iran's nuclear research in recent years has been its heavy reliance on underground structures for housing its related facilities.

The historical experience of the 1990s and 2000s with the military campaigns by NATO and the United States may be considered to be one of the reasons Iran has sought its own nuclear capability. It would appear that the leadership in Iran has learned well the lessons of Yugoslavia and Iraq, where the lack of any deterrent led to the overthrow of unpopular political regimes, while North Korea (a regime no less rogue in Western eyes) has maintained its position by creating first a virtual, then a real deterrent in the form of a

number of nuclear explosive devices. It is possible that Iran considers the very presence of sensitive NFC technology to be a means for deterring any potential use of force. Iran both now and under the Shah has perceived the development of nuclear technology to be not only a means of deterrence, but also an element of national prestige and an attribute of its regional dominance in the Middle East.

It is now evident that the policy of isolating Iran and imposing sanctions in its current form has been inefficient. Nor can there be a military solution to the crisis. This means that a resolution has to be sought in the political and diplomatic sphere. Negotiations with Iran must be based on the principle of reasonable sufficiency and conducted as normal arms limitation talks (in this case, limiting the ability for creating nuclear weapons), using the rich experience gained during the 1970s-1990s. There are still several years left to reach agreement.

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CHAPTER 5

THE NORTH KOREAN PRECEDENT

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The retrospective history of North Korea's nuclear program and its relations with the international community within the current context can elicit at least two conclusions. First, Pyongyang has been waging a war for its survival, in which it has spared no expense. From this standpoint, its pursuit of a nuclear capability that would deter outside pressure becomes easier to understand. Second, no progress will be made unless the United States and its allies fundamentally reconsider the very paradigm of their relations with North Korea.

Washington has been anticipating the imminent collapse of North Korea since as long ago as the early 1990s (in spite of opinions to the contrary expressed by many specialists in the field, including Russian experts), believing that this would have led to the natural termination of North Korea's military nuclear program, which by the mid-1980s had reached industrial scale. This was the primary reason that Washington felt no haste in implementing the Framework Agreements with Pyongyang that it had concluded in 1994, which would have frozen the development of the nuclear program in North Korea. This turned out to be a "negative lesson" for North Korea, a fact which has been confirmed by such authoritative U.S. specialists as Siegfried Hecker, director emeritus of Los Alamos National Laboratory, who observed, "Congress failed to appropriate funds for key provisions of the pact, causing the United States to fall behind in its commitments almost from the beginning."¹ He summarized by saying, "Pyongyang turned to the United States, but it found Washington unreliable and inconsistent."²

The collapse of the search for compromise provoked a new crisis in 2002, when the Bush administration used contradictory signals being received about North Korea's uranium program as reason to shift to a harder-line policy. Once again, contrary to the advice

of many experts, the United States tried to use pressure, isolation, and sanctions to gain concessions that would “force North Korea to behave itself.” However, not even the ideologues who supported the approach appeared to believe that it could be accomplished. In actual fact, the policy had been intended to induce a “soft” regime change in North Korea; what it ended up doing was to spur North Korea on in its pursuit of a nuclear bomb.

Despite the shift toward a more conciliatory approach with respect to Pyongyang in the “late” Bush era, during the next round of bargaining over North Korea’s nuclear program (2003-2008) its opponents in practice worked to delay implementation of the commitments that had been agreed upon during the first stage of the Six-Party Talks under the Statement of Principles, denuclearization in exchange for peace and assistance. This was finalized on September 19, 2005, in a compromise form in the Joint Statement of the Fourth Round of the Six-Party Talks. Such a formula, however, was unsatisfactory for the advocates of “regime change.” U.S. conservatives pursued this goal in quite a linear fashion, allowing the proponents of a more pragmatic line little room to maneuver. Pyongyang responded accordingly.

The United States, for example, imposed financial sanctions on accounts linked to North Korea in Macao’s Banco Delta Asia (essentially isolating North Korea from the global financial system) immediately following the conclusion of the agreements above. In response, North Korea conducted a nuclear test on October 9, 2006. Upon subsequent (and consequent) resumption of the negotiation process, agreement was reached in February 2007 on a denuclearization Action Plan, the initial phase of which committed North Korea to decommission its nuclear reactor in Yongbyon. However, delays in unfreezing the Macao accounts once again slowed the fulfillment of these obligations. Only after this dispute was resolved (helped along by a Russian agreement to ensure the transfer of funds to North Korea) did the parties to the Six Party Talks finally manage to adopt a “second phase” denuclearization Action Plan (on October 3, 2007).

However, there was no uniformity in approach among North Korea’s opposite numbers. Japan refused to participate in offers of economic assistance, and by placing the “kidnapping issue” at the forefront (primarily for internal political reasons), it began to play an essentially unconstructive part in the multilateral peace process.

Meanwhile, with the accession of Lee Myung-bak's conservative government to power at the end of 2007, Seoul performed a full review of all agreements on coexistence and cooperation that had been signed under the administrations of presidents Kim Dae-jung and Rho My-hyun. From the very beginning, many suspected that the government of Lee Myung-bak had been using the "mutual benefits" rhetoric as a cover to "soften up" the regime in North Korea for subsequent peaceful annexation by the South. Pyongyang was particularly upset when Seoul focused on the nuclear problem, which the North saw as being a subject of bargaining between itself and the United States. Two months after the election of the new South Korean president, North Korea sharply criticized him as a "national traitor"⁷³ and set course toward essentially ending its relations with the South and excluding it from discussion of the nuclear issue.

By the end of the presidency of George W. Bush, the prospects for achieving any real compromise between the United States and North Korea were looking ever more bleak. Pressured by the conservative wing, the Republican administration began to insist that North Korea fully and completely disclose its nuclear activities. No compromise on this issue was reached until mid-2008. The United States delayed the implementation of its promise to remove North Korea from the list of the state sponsors of terrorism (in part due to Japanese opposition), which was done only in October 2008. After this, the verification problem reached a virtual impasse when the United States presented North Korea with a list of extremely strict and clearly premature demands that were reminiscent of the inspections in Iraq in 1991 (including opening all facilities to inspectors, allowing sampling, providing access to any documents, and so on). At the same time, these demands had not been stipulated in any of the documents previously adopted at the Six Party Talks. This was the reason behind the subsequent instability of the situation.

The new administration in the United States had its own opportunities to reverse these dangerous trends and reach a compromise with North Korea, but in the early stages of President Obama's term in office, he did not see the Korean problem as being of a high priority (experts say that it "did not even make the top 20.") Pyongyang, however, had relied on Obama's election campaign rhetoric about his willingness to negotiate and compromise, and perhaps expected more. Liberal-leaning U.S. experts advised Obama to make a breakthrough by offering North Korea a "big package deal" (including

a U.S.-North Korea summit) that would set up a framework for peaceful coexistence based on a formula of “denuclearization in exchange for economic assistance and normalization.” There also appears to have been a peace treaty offered to Pyongyang⁴ in exchange for North Korea’s promise to fully abandon its positions with respect to its nuclear status. However, as has been seen over recent years, any plan that involved first giving away the nuclear card was totally unacceptable to Kim Jong-il.

Unlike the previous crises of 1993 and 2002 (which had arisen largely as a result of U.S. actions), the heightened tensions in 2008-2009 were caused primarily by deliberate moves made by North Korea, which Pyongyang called its response to the hostile policies of its foes. By late summer 2008, North Korea had already begun reporting that it had no interest in any further discussions on denuclearization, and that “concerned organizations (in North Korea) are demanding that work at the Nyongbyon site be resumed.”⁵ On October 27, the *Rodong Sinmun* newspaper appealed to “strengthen military deterrence in the interests of self-defense, no matter what anyone else may say ...in the face of a nuclear missile threat from the United States.” Meanwhile, a statement by the North Korean Ministry of Foreign Affairs in November contained a strong protest against U.S. efforts to force North Korea to comply with its commitments with respect to verification of the nonproliferation regime.⁶ The December 2008 Six-Party Talks ended in failure. When Pyongyang politicians concluded that it would be unacceptable to give up “the nuclear card,” this had already become predictable and quite in character.

It appears that North Korea had decided at this very time to take an entirely new tactical approach based chiefly on its refusal to seek compromise with the United States and set course for outright confrontation in order to reinforce its position with respect to its opponents and rally domestic morale, while inside the country this policy called for the restoration of Kim Il-sung-style order and struggle against “deviations from socialism.”

In early 2009, Pyongyang began making bellicose statements. On January 13, a representative of the North Korean Ministry of Foreign Affairs declared that the verification demands made by the United States under the Six-Party Talks also implied similar inspections in South Korea, noting, “unless the U.S. stops its hostility toward North Korea and removes its nuclear threat, our country will never

abandon nuclear weapons first, not even in 100 years.”⁷ Military authorities declared their non-recognition of the line of demarcation in the Yellow Sea and threatened to use force against South Korea.⁸ Later, in early 2010, North Korea escalated tensions even further by launching a series of artillery strikes in the Yellow Sea region.

At the end of January 2009, news came that North Korea was preparing to launch a ballistic missile.⁹ Despite pressure (in particular from Japan, but also from the United States and the West as a whole), North Korea went ahead with its “semi-successful” launch (officially described as the launch of a satellite) in early April. This provoked a rather strong international reaction in the form of a statement issued by the Chairman of the UN Security Council and an unexpectedly principled position taken by China. This gave Pyongyang leaders the reason they needed to further harden their foreign policy line, a move that (as seen above) had been planned long before.

The breaking point was North Korea’s somewhat unexpected decision to leave the Six-Party Talks in response to the above-mentioned UN Security Council Statement, which it announced on April 14 in a strongly-worded statement by the North Korean Ministry of Foreign Affairs concerning the UN decision (“North Korea vehemently refutes and condemns the unjust action taken by the UNSC, which wants only to infringe upon the sovereignty of North Korea...”), going so far as to question the very need for North Korean membership in the United Nations. Pyongyang expelled the IAEA inspectors and announced that it would reconsider the decision to halt its nuclear program, and intended to resume it.¹⁰ As early as April 25, the Ministry of Foreign Affairs reported that uranium fuel rod processing had begun.¹¹

Responding to Washington’s condemnation of these provocations, Pyongyang castigated the United States, noting that “the present U.S. ...administration is nothing different from the preceding administration which frantically worked to stifle by force other countries which incurred its displeasure.”¹² At the same time, Koreans in the north point to the fact that they, unlike South Korea or Japan, have never had a “...nuclear umbrella protecting us from a U.S. military threat. ...The only part of the Korean Peninsula and surrounding regions that has not been protected by nuclear weapons or a ‘nuclear umbrella’ remains the northern part of the Republic.”¹³

Only 40 days later, on May 25, 2009, North Korea conducted a nuclear test that could hardly have been prepared for within such

a short timeframe, and carried out several more missile launches. Tensions with the South increased: North Korea withdrew from the Korean War Armistice Agreement of 1953, legally ending up in a state of war with the UN coalition of forces. In response to UN Security Council Resolution 1874 of June 12, 2009 (which imposed new sanctions on North Korea for its nuclear testing), North Korea announced that it would undertake a program of uranium enrichment activities, warning that the extracted plutonium would be “weaponized,” threatened to conduct new missile tests, and promised a decisive military response to any blockade attempts.¹⁴ On June 4, North Korea carried out missile launches that were clearly aimed at demonstrating its “political resolve” to the United States and to the world community as a whole. In early September, North Korea announced that its “experimental uranium enrichment has been successfully conducted to enter into completion phase.”¹⁵ Following the U.S. refusal to resume negotiations on North Korea’s terms (the most important of which was immediate discussions on matters of political normalization issues, and denuclearization afterwards), Pyongyang again opted for provocation (the above-mentioned artillery shelling in a disputed part of the Yellow Sea, etc.).

In order to analyze the guiding motives for these shifts in North Korean policy, it is important to consider the balance between internal and external factors that have caused the North Korean leadership to take a harder line, which necessarily leads to the conclusion that this “turn” has to a great extent been brought about by internal processes and factors, although external factors also have served as “catalysts.”

At some point, the North Korean leadership must have concluded that negotiations and diplomatic means might not work toward achieving their strategic priority: the survival of the regime. This anxiety provided a greater voice to the conservative forces, which soon won the leadership’s ear.¹⁶

It appears that the “moment of truth” came with the illness of Kim Jong-il, who vanished from sight for over three months in August 2008. This situation greatly alarmed the country’s political elite, which recognized the fragility of a system that rested on the power of one man. It was becoming clear that haggling with the West would not guarantee the survival of the political system should instability increase domestically against the backdrop of an eventual change in leadership. Foreign threats and images of the enemy may be a well

tested means for rallying the citizenry, but true leadership succession and stable continuity of government management require that the process of power transition take an appropriate amount of time and be multi-staged, thus granting the new leader the necessary legitimacy (the naming of the leader's youngest son, Kim Jong-un, as successor is only the beginning). A smooth transition of power requires the consolidation of the people and the elite and a guarantee of the country's inviolability. Kim Jong-il appears to have decided to leave the "nuclear shield" to future leaders as an inheritance.

Seeing no prospects for winning concessions from the West and enduring the consequences of economic sanctions, the leadership in Pyongyang decided to meet the challenges facing the country by restoring "our brand of socialism," banning market mechanisms and returning to a strict centralized planning system and a command system of state-governed distribution of goods. Beginning in early 2009, restrictions on market trade were tightened, and at the end of the year monetary reform (redenomination) was instituted, with the old won notes being exchanged for new ones at a rate of 1:100 and the allowed exchange amount limited to 100,000 to 300,000 won (less than 100 dollars at black market rates). Stores were closed and currency exchange halted. These measures were universally viewed by Western analysts as an effort to eliminate "the middle class," that is, those people who had survived the foodless 1990s and subsequent periods by learning how to make money outside the paralyzed state sector.¹⁷ At the same time, these reforms were an effort to increase the incomes of workers in the state-controlled sector, but in the absence of products on the market, this increase soon became a mere illusion. Hopes that it would be possible to achieve a new balance between the number of goods on the market and the money supply were not borne out. The country suffered shortages, inflation, and the (unofficial) exchange rate for the national currency began to plunge sharply.¹⁸

There is yet another extremely important circumstance that must be considered in this situation. It is well understood that economic reform, which always places a heavy burden on the shoulders of the common people and is associated with social, economic, and political risks, can be undertaken only when the country is secure in its external environment and has access to international financial resources. China and Vietnam had found themselves under just such favorable circumstances and were able to successfully complete their market

transformation programs. Kim Jong-il had also been hoping for similar foreign conditions when he launched his economic reforms in July 2002, but the international community failed to apply the effort needed to support this important endeavor. The fact that Pyongyang has recently found itself in deepening isolation, under sanctions and under pressure (in other words, a “fortress under siege”) was one of the fundamental reasons that forced it to return to centralization and “tighten the screws.” Unfortunately, it appears as though yet another analyst’s forecast is coming true: the hard line taken in order to isolate and pressure Kim Jong-il will indeed force him to abandon a national program, but it will be the economic reform program that he abandons, not the nuclear program.

At the same time, the ideological pressure is ramping up, and the campaign against the intrusion of foreign pop culture (especially from South Korea) has intensified. In short, the “fortress under siege” mentality will be ascendant in North Korea for the foreseeable future, and under such a belief system, a nuclear shield can be both a symbol and a guarantee of calm.

What, then, should U.S. strategy be? The missile and nuclear tests have brought North Korea into focus for White House policy, and this suits the ambitions of the North Korean leadership, which has sought to position itself as an equal partner of the United States. North Korea seeks to secure a status similar to that of India or Pakistan, after having seen for itself that the nuclearization of these two countries has not damaged their cooperation with the United States. At the same time, Pyongyang understands that theoretically only the United States can offer the kind of security assurances to the ruling elite that they desire above all. This perspective, however, goes entirely counter to the strategic goals of Washington, which emphasize nuclear disarmament first. Moreover, many in the United States believe that real, irreversible and verifiable denuclearization in Korea can only occur through regime change. For deeply ideological reasons, the country’s ruling establishment is not prepared to accept the continuation of the Kim Jong-il regime and would want it to collapse, even if North Korea were to accept all of the denuclearization demands. In addition, a manageable level of tension in Northeast Asia actually serves the geopolitical interests of the United States by justifying its military presence in the region and its military alliances with Japan and South Korea, and also fits into its long-term strategy for deterring China.

China, however, will never agree to “give up” North Korea (which has been a part of its sphere of influence for centuries), for both geopolitical and military reasons (U.S. troops near the borders of China), and to avoid potential territorial claims by a reunified Korea.

Although these problems affect the vital interests of both Japan and South Korea, the two countries have only a limited capacity to pursue an independent policy with respect to Korea. Both must appeal to the United States to achieve the decisions that would suit them; neither has the right to make such decisions on its own.

Under Barack Obama, the U.S. strategy on Korea has been evolving in a contradictory way and in consideration of the actions of his predecessors. The approach during the “Clinton Era” of promising North Korea a normalization of relations and aid in exchange for the liquidation of its nuclear program, became compromised both in Washington (which had never seriously intended to fulfill the promises to North Korea in the first place) and (consequently) in Pyongyang. The “action for action” policy of the second George Bush (or rather, of Condoleezza Rice and Christopher Hill), based on making step-by-step progress, will never bring about results that could satisfy both parties unless certain strategic decisions have been made: the United States must agree to coexist with North Korea, and Pyongyang must promise to make concessions not only on the nuclear issue, but on demilitarization and openness as well. For now, this is something that lies beyond the bounds of practical politics.

The Obama administration has opted for the rather contradictory tactic of combining pressure and sanctions, refusing to recognize North Korea’s nuclear status while attempting to return Pyongyang to the negotiating table under the old parameters (in other words, using the multilateral format and based on the assumption that Pyongyang’s unconditional obligation is to eliminate its nuclear program on its own, regardless of the outcome of the talks). Washington has insisted on implementing the previous UN Security Council sanctions, attempting in particular to curtail arms exports by North Korea in the hope that the loss of income would make Pyongyang more willing to talk. This option would only be a stopgap measure, since the objectives of the talks themselves have not yet been determined. With matters being as they are, Pyongyang sees no benefit in negotiation and is avoiding

dialogue under the pretext that it cannot be conducted “on equal terms” until the sanctions have been lifted.

The parties are not yet ready for a “big package deal,” although this clearly remains the only hope for achieving a comprehensive resolution in Korea. There is a real chance (but no guarantee) for Obama to improve the situation (even if it means moving the goal of denuclearization “beyond the horizon”) by reaching out to Kim Jong-il and offering Pyongyang a serious “package deal” that doesn’t contain a “false bottom.” The conditions for such a package deal have been well known for years; Russia had proposed its key elements as early as 2003: for the United States it would mean official and actual recognition of North Korea; in other words, it would offer political existence and security guarantees confirmed by the global community. Such a package would probably need to be based upon an underlying agreement between North Korea and the United States that would include monitoring and international assurances from the global community, or in any case from the four states. Without this, no progress toward denuclearization can be possible; even with it, however, there are no guarantees that it would happen.

Meanwhile, the search for a compromise between the United States and North Korea has again lapsed. Following Bill Clinton’s visit in August 2009, the North Koreans proposed the potential outlines of a primarily bilateral compromise solution. The United States, which had insisted for many months that such negotiations could occur only within the framework of the Six-Party diplomatic process, was forced to agree to communicate, after stating evasively that the United States was prepared for bilateral talks if it would help advance the six-party process. Pyongyang had gotten its way, not only regaining, but actually improving its position.¹⁹

An attempt to restart the diplomatic process was made in December 2009 during the Pyongyang visit of Stephen Bosworth, U.S. special representative for North Korea Policy, bearing a letter from the President to Kim Jong-il. The North Korean side listed its demands (an end to sanctions and a peace agreement), then later used a traditional New Year’s editorial to call publically for improved relations with the United States, establishment of a mechanism for achieving peace through negotiation, denuclearization of the Korean Peninsula, and pursuit of a dialogue between the two Koreas.²⁰ Pyongyang appealed for an end to hostile relations with the United States, calling it the most fundamental task that needed to be done to ensure peace

and stability on the Korean Peninsula and in the whole of Asia.²¹ On January 11, 2010, the North Korean Ministry of Foreign Affairs released a statement that officially proposed the opening of peace treaty negotiations with the United States. However, Washington dismissed all of these openings.²² The insurmountable barrier continues to be the fact that, while the United States is willing to discuss only the question of the denuclearization of North Korea, Pyongyang believes that more fundamental issues of insuring its security need to be discussed, including a new peace regime.

The Obama administration's unwillingness to seek outside-the-box solutions is difficult to understand. Resistance to compromise by allies (which used to hobble the Rice-Hill tandem) has eased. The socialists who came to power in Japan in 2009 were more flexible on North Korea than their conservative predecessors, who had spent four decades in power focusing on the intractable "kidnapping issue" that the North Koreans could hardly resolve in a way that would suit Japan. At the same time, the South Korean government of Lee Myung-bak also had to soften its approach and position itself for the new situation as Washington and Pyongyang began to sound each other out.

In August 2009, hopes rose that relations between the two Koreas might improve. From August 26, Seoul and Pyongyang resumed talks on reuniting families separated by war. Particularly noteworthy was the arrival in Seoul of a six-member delegation of high-level North Korean government officials, headed by Workers' Party Central Committee Secretary Kim Ki-nam, to attend the funeral of former South Korean President Kim Dae-jung, who had died on August 18. Bilateral contacts were renewed, including in the area of economic cooperation on the Kaesong Project (free economic zone) and the Kumgang Project (tourism). The South began to assert that it had always supported direct dialogue between Washington and Pyongyang, "if such talks help to promote the denuclearization of the North." Lee Myung-bak took a decidedly proactive approach to showcase South Korea's "leading role" in the diplomatic process. Speaking in the United States on September 22, he offered North Korea a "grand bargain," i.e., stimulatory political and economic benefits for Pyongyang (including security guarantees) in exchange for immediate (as opposed to gradual) termination of its nuclear program. Lee Myung-bak also publicly suggested the possibility of a summit with Kim Jong-il.

However, this “denuclearization in exchange for promises” approach proved to be totally unacceptable to Pyongyang, which called such proposals “absolutely impracticable.”

It is possible that to expect North Korea to renounce its military nuclear program under the current process of negotiation might very well be unrealistic. Unofficially, North Korea argues that “the termination of a program representing over 40 years of nuclear weapons development would imply a renunciation of the basic ideology of military preeminence in North Korea and of all the postulates relating to the transformation of North Korea into a wealthy and vigorous power.” The North Koreans insist that they will talk only with the United States, and although North Korea might make some concessions in the field of nuclear disarmament, it will “never completely renounce nuclear weapons, whether during Kim Jong-il’s lifetime or after his death.”²³

The allies have not fully formulated their demands on “denuclearization.” In any case, even in the unlikely case that it would forego all of its nuclear activities, North Korea would still have the scientific and technological potential to resume weapons research at any time. Obviously, the realistic discussion must be limited to the elimination of North Korea’s military nuclear capability (combat weapons and stocks of fissile material). In order to provide a guarantee of this, Pyongyang will have to rejoin the NPT and permit resumption of full IAEA inspections.

Over the midterm, it appears quite likely, however, that North Korea will retain its limited nuclear capability, a conclusion that many top U.S. experts are also beginning to accept. Hecker, for example, writes that it is unlikely that North Korea can be forced to give up the bomb. Realistically, military options are off the table...²⁴ They also note that the United States is *de facto* beginning to apply to North Korea essentially the same model of relations that it has with India, Israel, and Pakistan.²⁵ Consequently, they reason, it would be more realistic to make an effort to return North Korea to the IAEA rather than to the NPT, since the former allows for cooperation with nuclear-weapon states.²⁶

This obviously does not imply that all negotiations on Korean Peninsula denuclearization have become meaningless. It is imperative to resume both the Six-Party Talks and other negotiation forums in order to draw North Korea back into the mainstream of non-proliferation efforts and rules. Should constructive attitudes prevail,

the first stage of the negotiations could very well freeze North Korea's nuclear capability at its current level, restoring international controls over its nuclear activities and ensuring the principles of the nonproliferation of nuclear arms, technology, fissile material, nuclear experts, and so on beyond North Korea. This is critically important in and of itself, and is certainly better than having no talks and seeing the confrontation continue while North Korea continues to arm itself with nuclear weapons.

The negotiating process will also help in the normalization of relations between North Korea and South Korea, Japan, and the United States, i.e. restore the potential of the policy of "engagement." After all, it has been generally agreed that Pyongyang has been willing to slow its drive for nuclear weapons only when it has believed that the fundamental relationship with the United States was improving, and not when the regime has felt threatened.²⁷

NOTES

- 1 Siegfried S. Hecker, "Lessons Learned From the North Korean Nuclear Crises," *Daedalus* (Winter 2010): P. 49.
- 2 *Ibid.*, P. 52.
- 3 *Rodong Sinmun*, April 1, 2008.
- 4 <http://www.reuters.com/article/topNews/idUSTRE51C62520090213?feedType=RSS&feedName=topNews&pageNumber=2&virtualBrandChannel=10112>.
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- 21 Ibid.
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- 24 Hecker, "Lessons Learned," P. 53.
- 25 Sharon Squassoni and Fred McGoldrick, "Nonproliferation Policy Towards North Korea," Nov. 24, 2009, P.1, <http://www.nautilus.org/DPRKPolicy/SquassoniMcGoldrick.pdf>.
- 26 Ibid., P. 3.
- 27 Hecker, "Lessons Learned," P. 54.

CHAPTER 6

THE SOUTH ASIAN STANDOFF¹

Peter Topychkanov

Relations between India and Pakistan are usually described in terms of conflict, rivalry, or competition. These characterizations have a historical basis: after India and Pakistan gained independence in 1947, there were four wars and major military conflicts between the two countries (in 1947, 1965, 1971, and 1999). The Kashmir dispute has been one of the main sources of regional instability. From India's perspective, it was during the Kashmir dispute that Pakistan started using terrorist groups as part of its regional strategy. From this point of view, the activity of these groups' activities brought several benefits to Pakistan, including strategic (terrorists operating in India provided "strategic depth" and "early warning capability" to Pakistan),² military (they were a low-cost instrument with which to wage a proxy war), and political benefits (they were a means to apply indirect pressure on India and intervene in its domestic affairs).

Regional security has also been affected by other problems, namely, sharing water from the Indus and territorial disputes over the Rann of Kutch and the Siachen glacier. Some authors believe that these three issues have been resolved successfully,³ but in the opinion of a number of Pakistani diplomats and experts interviewed for this report, the Indus water dispute could result in an escalation of tensions in South Asia. All of these problems have created a high potential for conflict.

In the 1980s, in response to these challenges, India and Pakistan created something described as a "recessed deterrence" (deterrence without nuclear weapons, but on the nuclear threshold).⁴ The evolution of this situation into a state of nuclear deterrence in 1998 may be considered a response to the security challenges as well as a security challenge in itself. India and Pakistan appeared to have gotten into a Stability-Instability situation.⁵

India: the Road to Nuclear Weapons

After India gained independence, its leaders frequently declared that the country had no intention of building nuclear weapons and that nuclear power would be used only for peaceful purposes. They have called for the nonproliferation and prohibition of nuclear weapons and the elimination of nuclear tests. At the same time, the pursuit of peaceful nuclear research provided an opportunity to support their military program using predominantly domestic resources.

During the Cold War years, the development of India's nuclear program was driven by the following factors:

- Serious confrontation with Pakistan, which led to repeated military conflicts between them (1947-1948, 1965, 1971, and 1999). India and Pakistan each view the other as its chief military adversary, and this has stimulated the development of mutual "resistance and intimidation" measures.
- Increased tension in relations with China that followed the 1959 Tibet incident, India's defeat in the military conflict with China in 1962, China's 1964 entry into the nuclear-weapon club, and the existing territorial disputes between the two.
- A dangerous level of international tension during the period of confrontation between the two superpowers and the arms race taking place in the regions surrounding India. A base for the U.S. military has been built in the immediate vicinity of India on islands in the Indian Ocean, the waters of which are sailed by U.S. Navy ships having nuclear weapons aboard. India perceived a particular threat in the development of military cooperation between China and Pakistan.

Influenced by these factors, in 1960 India began to produce nuclear materials of a military nature at the 40 MW CIRUS reactor (built in India with Canadian assistance). In 1965, the Indian government approved in principle the idea of carrying out an underground nuclear test, in spite of having also signed the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water. India conducted its first underground nuclear test in 1974 with a 12 to 15 kiloton device (an explosive force equiv-

alent to that of the atomic bomb dropped on Hiroshima). Despite the professed peaceful nature of the test, it was seen abroad as a response to the increasing nuclear missile capabilities of China.⁶

After India defeated Pakistan in the war of 1971, it significantly expanded its lead in conventional weapons. U.S.-Pakistan military cooperation had been temporarily frozen, and China was also less than interested in openly providing military assistance to its ally. Although the level of threat to India from Pakistan declined as a result, the confrontational tone remained in relations between the two countries, on numerous occasions verging on outright military conflict. The stumbling block between the two continued to be the problem of Kashmir.

From the late 1980s on, China and India made some positive breakthroughs in their relations. Beijing signed and ratified the Nuclear Non-proliferation Treaty, declared its adherence to the no-first-use principle for nuclear weapons, joined the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on their Destruction (the Chemical Weapons Convention, CWC), and signed the Comprehensive Nuclear Test Ban Treaty (CTBT). The confrontational tone in Sino-Indian relations began to yield to normalization, to expanded cooperation and improvement of the situation, and to implementation of trust-building measures along the border. In 1996, the two sides concluded an agreement to gradually reduce the numbers of troops and weapons in the border region, and have since reaffirmed their mutual renunciation of any operations intended to gain unilateral advantage in the area surrounding the border; i.e., they agreed to carry out trust-building measures along the border.⁷ However, India viewed the continuing military and technical cooperation between China and Pakistan as being a serious threat to its security.

With the end of the Cold War, the weakening of India's chief regional rival (Pakistan), and the beginning of normalization of relations with China, the level of threat to India's security declined tangibly both regionally and globally. Nevertheless, India not only did not slow the pace of development of its military nuclear program, but actually accelerated it.

The reasons for this lay, first, in India's geopolitical interest in gaining prestige, not only in South Asia but internationally as well, based on its desire to be accepted as a world power on a par with the five

permanent UN Security Council Members that also comprise the nuclear-weapon club. India felt that in an era when nuclear weapons continue to symbolize both influence and strength, it could achieve the status of a world power either by crossing the “nuclear threshold,” or by stripping the “five nuclear-weapon states” of their exclusivity, which would be possible only in the case of their general and complete nuclear disarmament.

In its actual policies India exhibited no preference for either option, but nevertheless continued to make progress along both lines. It advanced and supported the proposals that would free the world of nuclear weapons and rejected all half-solutions to this global objective. India would withhold support or oppose one anti-nuclear proposal or the other by stating that it did not conform to policy.

Thus, although it initially saw the NPT as the quickest way to eliminate nuclear weapons and came out in support of the Treaty, once it had concluded that the Treaty served only to consolidate the nuclear monopoly of the five nuclear-weapon states and discriminate against the great majority of states, it began opposing the Treaty. In 1993, India became one of the initiators of the Comprehensive Nuclear Test Ban Treaty and had proposed drafting a special article to the Treaty that specified an exact timeframe for the elimination of all nuclear weapons. Inasmuch as its proposal failed to be adopted, India spoke in opposition to the Treaty’s ratification at the September 1996 session of the United Nations General Assembly. Delhi’s refusal to back the CTBT was also motivated by its desire to keep its options open concerning its own nuclear tests.

In light of the above, it would be difficult to see Delhi’s pro-disarmament line as much more than political propaganda.

Second, the threat presented by a nuclear China and by Pakistan (which at the time was still a threshold nation) was put to energetic use during the internal political debate among the various political parties and public organizations in India to support the development of nuclear weapons.⁸

Third, the continuing tension, mutual distrust and suspicion in its relations with Pakistan (as well as the simmering dispute over Kashmir) were significant factors leading India to conduct the nuclear test of May 1998. Political dialogue between India and Pakistan had broken off, with the two sides accusing each other of harboring nuclear ambitions and deploying ballistic missiles along their common border, accompanied by threats to initiate an appro-

appropriate response and demands for international sanctions to be imposed against the other side. Armed confrontations continued along the border areas, with elevated tensions and terrorist activities in Kashmir. The emergence of nuclear-capable missiles in Pakistan only exacerbated the situation.

And finally, fourth, immediately prior to conducting its nuclear tests, Delhi declared the “Chinese threat” to be the main factor that had forced it to cross the “nuclear threshold.” Indian analysts perceived nuclear weapons as being an effective counterweight to China’s military superiority in both nuclear and conventional weapons.

The nuclear tests were carried out at the Pokhran test range in the Rajasthan region (where the 1974 nuclear explosion had been conducted) in two stages. On May 11, 1998, three nuclear devices were detonated, one (considered thermonuclear) with a yield of 45 kilotons, the second of 15 kilotons, and the third of less than one kiloton; two additional devices of under one kiloton were tested on May 13. Pakistan’s nuclear tests followed thereafter.

Experts estimate that India has between 30 and 35 nuclear explosive devices in operational readiness, as well as a certain number of finished components that would allow India to assemble an additional number of weapons within a matter of days. Its stockpile of weapons-grade plutonium is estimated at 225 to 370 kilograms, which would be sufficient to produce another 50 to 90 nuclear devices. Additionally, India also has a certain amount of weapons-grade uranium. Other estimates have suggested that India has between 45 and 95 nuclear weapons, and there is some information that India actually has between 60 and 100 devices in its nuclear arsenal.⁹

Using U.S.-Indian Relations to Engage India in the Nonproliferation Regime

In the official sources of the time, the development of U.S.-Indian ties during 2005-2008 was frequently referred to as a “breakthrough.” The preceding period of tepid relations between Washington and Delhi (caused by the latter’s aspirations to become a nuclear power in the aftermath of its 1998 nuclear tests) had coincided with Bill Clinton’s second term in office (1997-2001). In 2001, the new administration in the White House also ushered in a different ap-

proach in South Asia, which was not much noticed in the shadow of the U.S. campaign against international terrorism that dominated George W. Bush's first term in office (2001-2005). However, by his second term (2005-2008), these changes had become so apparent that the rapprochement between Washington and New Delhi is now recognized as one of the Bush administration's few significant foreign policy achievements.

The Barack Obama administration inherited from its predecessors the Agreement for Cooperation Between the Government of the United States of America and the Government of India Concerning Peaceful Uses of Nuclear Energy (or simply the 123 Agreement) which has usually been called the "nuclear deal." The Agreement had been signed by U.S. Secretary of State Condoleezza Rice and Indian Minister of External Affairs Pranab Mukherjee on October 10, 2008.¹⁰ A number of documents were associated with this Agreement, including the Joint Statement Between President George W. Bush and Prime Minister Manmohan Singh of July 18, 2005; the United States-India Cooperation Approval and Non-proliferation Enhancement Act (commonly known as the Henry Hyde Act), which took effect on October 8, 2008;¹¹ the Agreement Between the Government of India and the IAEA for the Application of Safeguards to Civilian Nuclear Facilities (approved by the International Atomic Energy Agency [IAEA] Board of Governors on August 1, 2008);¹² and the Additional Protocols to the Agreement approved on March 3 and ratified on May 15, 2009.¹³

The "nuclear deal" had been intended to form the basis for U.S.-Indian cooperation in the following fields: joint advanced nuclear power research; security at civil nuclear facilities; nuclear reactors and the nuclear fuel cycle; and the establishment of nuclear fuel stocks. The program's implementation was conditional on India separating its nuclear facilities into military and civilian branches, with the latter placed under IAEA safeguards.

The 123 Agreement, the Henry Hyde Act, and the Agreement Between India and the IAEA laid the legal basis for India to end its international isolation and resume imports of international nuclear technology and materials. During the three years of "nuclear deal" negotiations, discussions in India included both the hope of breaking out of the prolonged nuclear materials/technologies trade blockade and the fear that it might lose the independence it had gained thanks to its position outside the nuclear nonproliferation regime.

Other countries, primarily the United States, were also debating the possible consequences that ending India's isolation in exchange for certain commitments relating to the peaceful use of nuclear energy would have for the nonproliferation regime. In particular, the concern was expressed that the "nuclear deal" might signal to third countries that they could acquire nuclear weapons and, by establishing special relations with the world's great powers, still count on exclusive treatment.¹⁴

Since its implementation, the "nuclear deal" has borne some fruit, though benefitting India to a far greater extent than the United States¹⁵ (largely due to the transfer of power from a Republican to a Democratic administration).

The election of Barack Obama as president on November 4, 2008, raised concerns in India about the future of U.S.-Indian relations, based on the Democratic candidate's campaign promise to make nonproliferation one of the focal points of U.S. foreign policy. His speeches emphasized the need for deep cuts in the numbers of nuclear weapons in order to eventually eliminate them in the world altogether.¹⁶ During Manmohan Singh's September 2008 visit to the United States, Barack Obama sent him a letter saying, "I will work to secure ratification of the international treaty banning nuclear weapons testing at the earliest practical day, and then launch a major diplomatic initiative to ensure its entry into force. I will also pursue negotiations on a verifiable, multilateral treaty to end production of fissile material for nuclear weapons."¹⁷

During negotiations held between 2005 and 2008, U.S. representatives sought to obtain India's signature on the CTBT and its agreement to halt the production of fissile material for military purposes, but they were not successful.¹⁸ In the words of Manish Tiwari, the official spokesman for the All India Congress Committee, "Without compromising on our weapons program, without compromising on our fast-breeder reactor program, without signing the NPT, the CTBT or the Fissile Material Cutoff Treaty, India has been able to access the entire spectrum of civil nuclear commerce on very much its own terms."¹⁹

With the arrival of the new president, the question of whether India would join the existing treaties or agree to commit to obligations under these treaties came up again in the agenda of U.S.-Indian negotiations. The Indian side felt that undue emphasis on this might undermine implementation of the "nuclear deal." In 2008-2009, India

intensified its lobbying efforts against Washington's reconsideration of the agreement.²⁰

It was not until March 2009 that Washington assured Delhi that it intended to keep its commitments under the "nuclear deal." India's Deputy External Affairs Minister Shivshankar Menon paid an official visit to Washington on March 9-11, where he discussed the peaceful use of nuclear energy with Secretary of State Hillary Clinton and Deputy Secretaries Jim Steinberg and William Burns. These meetings concluded with Menon declaring, "I was really reassured by the determination to go through it (the nuclear deal)." He added that U.S.-Indian relations had reached "a new level."²¹

Before Secretary of State Clinton had even begun her July 17-21, 2009, visit to India, however, India had to contend with yet another reason for concern. The G8 Summit that had taken place on July-10 in L'Aquila, Italy, adopted the L'Aquila Statement of Nonproliferation, in which the G8 members called on the Nuclear Suppliers Group (NSG) to develop a document by the end of 2009 that would prohibit the transfer of nuclear enrichment technology to countries that had not signed the NPT, and to ensure NPT adoption in the other NSG countries.²² For the Indian side, represented at the summit by Prime Minister Manmohan Singh, this initiative came as an unpleasant surprise, although India no longer required enrichment technology and with U.S. help had already reached agreement with the NSG in 2008 (on September 6, the member nations of the NSG had declared that the "Participating Governments may transfer nuclear-related dual-use equipment, materials, software, and related technology to India for peaceful purposes and for use in IAEA safeguarded nuclear facilities.")²³ The L'Aquila Statement had convinced India that the question of India joining the NPT, despite the lifting of the international blockade, remained important to other countries (particularly the United States and Russia) that had an interest in cooperation with India.

Hillary Clinton's visit to India concluded with a Joint Statement in which the U.S. and Indian leaders professed the shared goal of a nuclear-free world and vowed to pursue a non-discriminatory, internationally and effectively verifiable Fissile Material Cut-off Treaty and to cooperate against nuclear proliferation and terrorism. Concerning the "nuclear deal," the Joint Statement announced that consultations would begin regarding cooperation on nuclear fuel processing.²⁴

During its term in the White House so far, the Obama administration has met with the same result as the Bush administration did during its three years of negotiations with India: an inability to effectively connect the partnership for the peaceful use of nuclear energy with India joining the nonproliferation regime. For this reason, Washington has been forced to treat cooperation with India as an issue apart from its concerns over nonproliferation.

The only compromise that the Indian side has proven prepared to accept was the agreement with the IAEA to separate its nuclear facilities into military and civilian, with the latter placed under Agency safeguards. However, under this agreement and its Additional Protocol, India will place these 14 facilities under Agency safeguards only by 2014 (currently, inspectors have been allowed access to six facilities.) Moreover, in contrast to the standard protocol, the Indian version does not stipulate any control over the import of nuclear materials or technology, on-site unannounced or short-notice inspections, or collection of samples at nuclear facilities or their surrounding sites, in other words, all of the kinds of control that are intended to detect undeclared nuclear activities.²⁵

During the period since the conclusion of the “nuclear deal,” U.S.-Indian relations have failed to bear any tangible fruit, either for the nuclear nonproliferation regime or for the development of cooperation in the nuclear energy field. The most important reasons for this are the following: first, the U.S. presidential election in the autumn of 2008 and the parliamentary elections in India in the spring of 2009 slowed the negotiations between the two countries, especially since attempts were being made both in Washington and Delhi to revisit the “nuclear deal.”²⁶ Second, there were circumstances of a legal and bureaucratic nature: by 2010, the United States had not yet lifted the most important prohibitions on the export of sensitive nuclear technology.²⁷ Besides, India has thus far failed to accept any legal liability for nuclear damage.

Pakistan and Problems of Nuclear Nonproliferation

Various papers dealing with nuclear issues have suggested that countries make the choice between using nuclear power for peaceful or for military purposes at the very inception of their programs (with

the exception of Argentina and Brazil, which developed nuclear power without any firm target objective). While Australia, Canada, Germany, Italy, Japan, the Netherlands, and other nations decided in favor of the "peaceful atom," the "Big Five" nuclear powers (Britain, China, France, the Soviet Union/Russia, and the United States), as well as India, Israel, Pakistan, and South Africa, have steadfastly pursued the production of nuclear weapons (the intentions of the latter four nations may be surmised from their refusal to join the NPT.)²⁸

The development of Pakistan's nuclear program followed India's example, literally repeating its every step. Even Pakistan's response to the May 1998 Indian nuclear tests was absolutely symmetrical: over the course of two days, Pakistan detonated six devices (India had detonated five devices in 1998, but back in 1974 it had exploded its very first device for supposedly peaceful purposes.) However, prior to the 1998 test, Pakistan had made a series of propagandatized proposals that appeared to be intended as deterrent political pressure on India to induce it to slow its nuclear development program. Thus, at various times Pakistan has proposed establishing a nuclear-weapon-free zone or a missile-free zone in South Asia; issuing a Pakistani-Indian declaration against the acquisition or production of nuclear weapons; and placing the entire range of nuclear facilities of the two countries under comprehensive IAEA safeguards. Pakistan was prepared to join the NPT simultaneously with India as non-nuclear states and join the future CTBT (also together with India); however, India did not support any of these proposals. Once Pakistan became convinced that India was intent on producing nuclear weapons, it began its own military nuclear program in the mid-1970s (the final impetus came from its defeat in the 1971 India-Pakistan War, which resulted in the creation of Bangladesh, and the Indian nuclear tests in 1974.)

By this time, compelled by its deficit in energy resources, Pakistan had achieved some success in developing its nuclear power sector. Only about 20 percent of the energy resources in Pakistan are extracted domestically, with the remaining 80 percent imported from abroad. Meanwhile, use of the Tarbela Hydroelectric Power Plant (the country's largest) has been complicated by an outstanding dispute with India over shared access to the waters of the Indus River.

Pakistan had begun developing the basics of its nuclear sector as early as the mid-1950s, but it lacked the scientific and technologi-

cal base and the raw materials resources needed to pursue a military nuclear program. In 1965, Pakistan commissioned a 10 MW research reactor that operated on fuel from the United States. In 1972, Pakistan launched its first 125 MW KANUPP Nuclear Power Plant in Karachi, the capital of Sindh province, with Canadian participation. China helped Pakistan to build its 300 MW Chashma Nuclear Power Plant near the country's capital, Islamabad, which began operating in 2000. These nuclear power plants fall under IAEA safeguards. On the whole, nuclear electric power accounts for no more than 2.3 percent of Pakistan's total energy supply.

In addition to building nuclear power plants, Pakistan also has engaged and continues to engage in extracting uranium ore, which is currently being processed in Dera Ghazi Khan and Isa Khel, Punjab province (since 1978 and 1990, respectively). The uranium undergoes enrichment in Kakuta, Punjab (since 1984), conversion in Islamabad (since 1986), and processing into uranium fuel in Chashma, Punjab (since 1986).²⁹ Pakistan built a facility for producing plutonium in Chashma in the 1970s, but France (which had helped to build it) ended its cooperation with Pakistan in 1978, having by that time discerned Pakistan's intention to develop nuclear weapons. None of these facilities fall under IAEA safeguards.

Pakistan's pursuit of civil nuclear technology allowed it to lay the scientific and technical foundation and other conditions for it to shift over to a military program, which it did not only because of the India factor; Pakistan was also seeking to reinforce its standing among Muslim nations by becoming the first of them to acquire nuclear weapons. The idea of an "Islamic bomb" was used successfully by former leader Zulfikar Ali Bhutto in his bid to obtain assistance from the Arab nations, with money to finance the bomb coming from Libya, Saudi Arabia, and the United Arab Emirates.

In developing its nuclear energy sector and missile delivery vehicles, Pakistan received assistance from China and North Korea. Cooperation with the latter may have contributed on the one hand to the development of missile technology in Pakistan; on the other hand, it spurred the development of North Korea's military nuclear program. According to data from the United States, in 1997 Pakistan had begun transferring nuclear weapons technology to North Korea (including models of centrifuges) and carrying out testing. In exchange, Pakistan acquired missile technologies.³⁰ It is true that official Islamabad now vehemently denies that such an interrelation-

ship between missile development in Pakistan and North Korea's military nuclear program ever existed,³¹ blaming the transfers of nuclear technology to North Korea on the illegal activities of Abdul Qadeer Khan.

Pakistan was able to work on its nuclear weapons program by putting its domestic resources under great strain and simultaneously cutting much of the government's spending. Zulfikar Ali Bhutto famously declared that "if India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own." An important role in this was played by Abdul Qadeer Khan, who had worked at URENCO, the European uranium consortium, between 1972 and 1975 before returning to Pakistan to head an industrial-scale uranium enrichment project set up in the town of Kakuta (near Islamabad) under the name of Project 706 (renamed Khan Research Laboratories in 1984). By 1987, Pakistan had acquired enough highly-enriched uranium to produce a nuclear device. At the end of the 1980s, Pakistan completed its final preparations for a nuclear test (according to some reports, China had given Pakistan the blueprints for a nuclear explosive device in 1983-1984.)

Pakistan's success in developing its nuclear technology raised the concerns of its chief strategic partner, the United States, where legislators had passed the Glenn Amendment (in 1976), Symington Amendment (in 1977), and Pressler Amendment (in 1985) to the Foreign Assistance Act (in 1994, these amendments were also applied to the Arms Export Control Act.) Unlike India, Pakistan lacked the technological base necessary to develop a nuclear program, so these amendments struck Pakistan hard (although in 1981, Pakistan was granted a six-year immunity from the Symington Amendment owing to its role in countering Soviet activities in Afghanistan). Pakistan solved this problem by smuggling the required components and nuclear materials into the country. Later, the network that Abdul Qadeer Khan had set up began arranging the import of these components and materials into Iran, Libya, and North Korea. The heavy veil of secrecy and lack of transparency or any kind of public control over his operations allowed Abdul Qadeer Khan to continue smuggling for many years, which brought in huge amounts of money. Pakistan's top military officers supposedly knew about these activities. It could not have been otherwise, given the military's close supervision of the nuclear program.³²

A thick curtain of secrecy and the absence of any civil control allowed Abdul Qadeer Khan to engage in lucrative trafficking over a long period. The discovery that Pakistani citizens had been involved in nuclear proliferation discredited Pakistan and helped India to deepen its nuclear cooperation with the United States; after all, India, unlike Pakistan, had never sullied its name with such violations.³³

The May 1998 nuclear tests complicated Pakistan's position even further. Citing UN Security Council Resolution 1172 (adopted on June 6, 1998), the United States imposed sanctions on Pakistan that curtailed many bilateral cooperation programs: funds for military and technical cooperation were cut off, the sale of dual-use goods to Pakistan was prohibited, and programs to stimulate trade and economic ties were stopped.

Pakistan, however, continued to stockpile nuclear materials for warheads, upgrade the quality of its missiles, and establish a system for the operational control of its nuclear weapons. The most important aspect of Pakistan's nuclear plans was to ensure that any nuclear attack on Pakistan or its armed forces would be followed by adequate nuclear retaliation capable of inflicting unacceptable damage on the aggressor.³⁴

In light of Pakistan's secrecy about its nuclear weapons, data on the number of warheads are fragmentary and differing. Most of the numbers are based upon Pakistan's estimated stockpiles of weapons-grade uranium and plutonium. Some U.S. experts, for example, believe that Pakistan has enough material for 30 to 50 uranium and three to five plutonium warheads that it could assemble within a matter of hours or days;³⁵ others believe that Pakistan's nuclear arsenal consists of 15 to 60 warheads, perhaps more.³⁶

After declaring its right to use nuclear weapons first, Islamabad announced that it could not join the NPT as a non-nuclear-weapon state, and took an evasive position on the CTBT. At the same time, it announced a unilateral moratorium on nuclear testing, expressed its readiness to halt the production of fissile materials for military purposes, and voiced its desire to join the negotiations on a new treaty that would prohibit the production of such materials for military purposes. Finally, Pakistan announced that it was opening two more of its nuclear facilities to IAEA inspection.

South Asia and the Nonproliferation Regime: Threats and Solutions

The military nuclear programs of India and Pakistan represent a number of threats to the nonproliferation regime: first, the threat of “vertical proliferation” (in other words, expansion of the nuclear capabilities of these nations); second, the danger of “horizontal” proliferation, or the transfer or illegal trafficking of nuclear materials, technology, or even weapons to other countries or to terrorist or extremist organizations. This would almost certainly increase the probability of nuclear weapons being used either in a war between India and Pakistan or during acts of aggression or terrorism against third countries. However, it would be a mistake to see such threats as easy to carry out.

With respect to the threat of “vertical” proliferation, it must be emphasized that the data from Indian, Pakistani, and other foreign sources indicate no evidence of any accelerated nuclear weapons development activity. For example, following the test launch of the two-stage *Shaheen-II (Hatf-6)* solid-fuel intermediate range ballistic missile on February 22, 2008, the chairman of the Joint Chiefs of Staff, General Ehsan ul Haq, stated that for Pakistan, “the strategy of minimum but credible deterrence plays the main role; it is the guarantee of peace in the region.”³⁷ Nuclear projects are being initiated and pursued at a slowed pace (especially obvious when compared to the 1970s-1990s).

The situation with respect to the threat of “horizontal” proliferation is more difficult. In this regard it has been primarily Pakistan, the “Khan network” and the country’s potential nuclear contacts with Iran and North Korea that are most frequently mentioned. It would, however, be difficult to imagine that Pakistan and Iran or North Korea, “under the microscope” of the international community, would think of pursuing such contacts today. Even if Pyongyang and Tehran are indeed ready for such contacts,³⁸ they would be extremely undesirable for Pakistan, which seeks to repair its name after the disclosure of the “Khan network.” Despite the elimination of this network, some of its elements (particularly those outside Pakistan) may still be functioning.³⁹ After all, the network had ties with other nuclear black markets that have remained in existence. Such markets usually form around nations that would like to develop nuclear

programs but lack the resources to do so, as well as those that lack the opportunity or the desire to participate openly in international cooperation. For example, such markets have arisen around India, Iran, Iraq, Libya, and North Korea. Aside from these, Argentina, Brazil, Egypt, Israel, South Africa, Syria, etc., as well as private firms from Australia, Germany, Malaysia, Switzerland, the United States, and other countries, have participated in illegal trafficking of nuclear materials and technology.⁴⁰

Clearly, the main problem with “horizontal” proliferation is not Abdul Qadeer Khan,⁴¹ but the lack of effective tools to extend control over the storage and transportation of nuclear materials internationally.⁴² In particular, there are no realistic controls over shipments by sea (the IAEA receives only the required documentation; the veracity of such documentation is never checked at the ports of shipment or destination.) Fearing nuclear terrorism, some Western states and Russia have been introducing new border controls for detecting shipments of radioactive materials, but such controls do not exist in most other countries, including the “problem” nations and those governed by “adventurist” regimes, where nuclear materials intercepted in transit could be delivered for assembly into nuclear explosive devices. Thus, vulnerable links will remain in the network of international cooperation on the peaceful use of nuclear power, unless significantly stronger methods for accounting, control, and security of the shipments of nuclear materials are developed.

Following the discovery of the “Khan network,” Pakistan was forced to introduce certain restrictions in this area. In May 2004, responding to a UN Security Council request to all UN members of the international community to tighten the effectiveness of controls over the proliferation of WMDs and the related technologies (Resolution 1540), Pakistan passed the Export Controls Act, which further tightened restrictions and punishment for the export of nuclear, biological, and chemical technology and materials. Violators face imprisonment for 14 years, a fine of five million rupees, and confiscation of property.⁴³

Other “horizontal” proliferation threats relating to Pakistan include the possibility that extremists or terrorist organizations might hijack either nuclear weapons or weapons-grade nuclear material, or that a Pakistani nuclear scientist might transfer sensitive information to another country, extremists, or terrorist organizations. Also of concern is the possibility of an attack or missile strike against its

nuclear facilities during a war between Pakistan and India. Experts have also spoken about the possibility of an unsanctioned launch of nuclear missiles. Finally, what is most often mentioned is the danger of political destabilization in Pakistan leading to radicals taking power who are imbued with the resolve to use nuclear force against India or other countries.⁴⁴

Most of these threats are seen as being unlikely. For example, Pakistan's radical elements have always enjoyed very limited political support (throughout the country's history, these forces have never managed to win more than 11 percent of the vote), and their chances of gaining power are illusory. Even if they do take power, the nuclear facilities would still remain under the control of the armed forces. Considering the fact that the use of nuclear weapons must be approved by three officials (the president, the chairman of the Joint Chiefs of Staff of the Armed Forces, and the director general of the Strategic Plans Division), the political authorities would have no realistic control over the country's nuclear capabilities.⁴⁵

Since the possibility of an unsanctioned launch of nuclear missiles has been acknowledged by both Pakistan and India, both countries have continued not only to regularly inform each other about their nuclear facilities in accordance with the Agreement Between India and Pakistan on the Prohibition of Attack Against Nuclear Installations and Facilities (the India-Pakistan Non-Attack Agreement), which entered into force in 1991, but also to take steps aimed at reducing the chances of a nuclear conflict breaking out between them. In February 2007, the India-Pakistan Agreement on Reducing the Risk from Accident Relating to Nuclear Weapons (intended to eliminate the chance of nuclear confrontation between the two nations and to establish reliable nuclear weapon control and monitoring systems in India and Pakistan) was signed. Under this Agreement, the two sides undertook to establish reliable systems of reciprocal warning at both the political and military levels along the Indian-Pakistani border in order to provide warnings about "false alarms," "emergency situations," and "inexplicable incidents," any of which could potentially provoke a nuclear response from the neighboring country.

As for the threat of a potential terrorist attack on Pakistan's nuclear facilities and theft of materials and technology, Pakistan has succeeded over recent years in substantially improving security at its nuclear facilities, which currently operate under three

levels of security: the first level is concerned with the internal protection of laboratories and other branches of the nuclear industry and the military nuclear program; the second level of security is controlled by a special nuclear security unit under the command of a two-star general (this group is manned by very well-trained military personnel) operating under the auspices of the Strategic Plans Division, which itself is a part of the National Command Authority. Headed by the president, the Authority is the most highly-placed agency of strategic force control, with all the key posts held by representatives of the armed forces. This level of security covers the nuclear facilities having between 8,000 and 10,000 employees. The third (and highest) level of security is provided by Pakistan's most powerful secret service, Joint Military Intelligence, which has a Technical Office under the command of a brigadier general to oversee the means of monitoring at nuclear facilities, such as surveillance cameras. The technology and equipment that this office operates comes from foreign countries, in particular the United States. All personnel manning these three levels of security undergo a rigorous selection process and are reviewed regularly. Experts have evaluated this nuclear facility security system (which was implemented under Pervez Musharraf) as transparent and effective⁴⁶ in significantly diminishing the danger of nuclear weapons, materials, or technology being stolen or captured.

The most likely scenario in this regard would involve the deliberate transfer of insignificant amounts of materials or of some nuclear components or technology by a nuclear facility employee. The chance that Pakistan's nuclear weapons might fall into the hands of terrorists seems to be essentially unfeasible, not only because these weapons are closely guarded, but also because India and Pakistan both follow the unwritten rule that their nuclear weapons should be stored un-assembled, with the warheads separated from the delivery vehicles, and the nuclear "filling" stored separately from the explosive charge. It would be a positive development if the two countries could turn this unwritten practice (implemented as a result of shortcomings in the systems of monitoring and control) into an official agreement between India and Pakistan.

On the whole, it must be admitted that although the nonproliferation regime is indeed threatened by the presence of nuclear weapons and military nuclear programs in India and Pakistan, these threats are not as ominous as some in the media would try to portray it.

Still, even the slimmest chance that such threats might materialize dictates that adequate countermeasures be sought.

Stabilizing the Nuclear Balance in South Asia

Obviously, most attention must be devoted to preventing conflicts between India and Pakistan, especially as concerns the potential use of nuclear force.

Many experts in India and Pakistan believe that the development of nuclear weapons in the two countries did achieve the major goal of deterring its opponent from undertaking a nuclear strike. This “nuclear optimism” could be accepted if the concept of nuclear deterrence were limited to minimal nuclear deterrence, i.e., the task of preventing nuclear war, which is part of the nuclear postures of both states. However, there are two counterarguments. First, nuclear weapons have not prevented conflicts between India and Pakistan (such as the Kargil armed conflict in 1999), and these have lowered the threshold for nuclear war. In the opinion of several senior experts at some Indian think tanks, the threshold drops even further in the aftermath of every terrorist attack in India that can be linked to Pakistan. Second, it can be assumed that the lack of military parity in South Asia and the relatively limited nuclear weapons experience of India and Pakistan have prevented them from establishing an efficient mutual nuclear deterrence. India and Pakistan have relative parity only in nuclear force numbers; however, this parity has been devalued by the wide differences in their nuclear postures.

As Zafar Iqbal Cheema noted in his study “Indian Nuclear Deterrence,” peace and security, and the very survival of the South Asian subcontinent, depend on the robustness of nuclear deterrence and strategic stability.⁴⁷ There are some offshoots within the larger framework of strategic stability, namely, deterrence stability and crisis stability. Cheema argues that a number of trends will seriously impinge on strategic stability in relations between India and Pakistan, the arms race in both fields, and the impact of asymmetry in conventional military capabilities on deterrence and strategic stability. The management and resolution of India-Pakistan disputes over issues of vital interest to both countries, the state of political and diplomatic relations, adherence to a security regime, and confidence-building measures are equally important.

In comparing key elements of strategic stability in today's South Asia with the same elements of strategic stability in relations between the Soviet Union and the United States during the Cold War era, a number of differences can be discerned, as well as similarities. These relate to the acceptance of the idea of mutual assured destruction (which made the possibility of a nuclear war low) and an implicit acceptance of the idea of strategic parity, despite the different mix of nuclear forces.

Both India and Pakistan have declared that they would adhere to credible minimum deterrence. Its main purpose is to prevent the use of WMDs by the other side (in India's case) and to prevent a critical war in which both WMDs and conventional weapons are used (in Pakistan's case). It is obvious that the meaning of the posture is different in each case, and at the same time is linked to the other country's. There are some unclear issues, however. In the case of India, minimum nuclear deterrence would require:

- Sufficiently survivable and operationally combat-ready nuclear forces;
- A robust command-and-control system;
- Effective intelligence and early warning capabilities;
- Comprehensive planning and training for operations in line with the strategy; and
- A willingness to use nuclear weapons.

The first unclear issue related to India's position is whether the highest stated credibility of its nuclear forces can be achieved without reinforcing the nuclear deterrent. In attempting to enhance the credibility and effectiveness of the deterrent, India's nuclear doctrine does not limit itself to "minimum nuclear deterrence."⁴⁸ The second unclear issue concerns India's no-first-use obligation. Today, when India does not possess an assured second-strike capability (for example, submarine-launched ballistic missiles, or SLBMs) and is creating its own ballistic missile defense (BMD) system, many experts doubt that New Delhi would strictly adhere to a no-first-use obligation.

In the case of Pakistan, minimum deterrence cannot be defined in static numbers.⁴⁹ In the absence of mutual restraints, Pakistan can change its nuclear arsenal and its deployment pattern in accordance with risks of preemption by the other side and interception of Indian nuclear systems. For example, the U.S.-India nuclear deal of 2008, from the point of view of Pakistani experts, has allowed

India to improve its nuclear arsenal, and U.S.-Indian cooperation has helped India to develop its BMD technologies.⁵⁰

In response, Pakistan secured the right to increase its number of nuclear warheads and expand its delivery systems, which is why it refused to support the CTBT and FMCT (even if India signs and ratifies these treaties, Pakistan, in the opinion of some Pakistani experts, will not be interested in following suit.) Under current circumstances, Pakistan will hardly be likely to use this right; nevertheless, Islamabad is keeping this option open.

Both nuclear optimists and pessimists agree, however, that nuclear weapons proliferation in South Asia will not lead to an intentional outbreak of large-scale war. Neither Indian nor Pakistani leaders wish to initiate a conflict that could end in a nuclear exchange with disastrous consequences.⁵¹

Still, a catastrophic conflict could occur, even though neither the Indians nor the Pakistanis intend to start a nuclear war. The pessimists believe that a nuclear exchange is likely to occur from a system's malfunction or a false alarm, especially in view of the still underdeveloped nuclear control systems and missile attack warning systems. The optimists argue that such a disaster in a nuclear South Asia remains unlikely, owing to the practice of lowering combat readiness during peacetime (the so-called "operationally dormant" state of nuclear arsenals, under which it would take India and Pakistan hours to weeks to restore their retaliatory capabilities).⁵²

With respect to another element of the Cold War's strategic stability (the limits placed on offensive nuclear weapons, which help to prevent an unconstrained arms race), there has been no such agreement reached between India and Pakistan. Neither India nor Pakistan is interested in seeing its own nuclear arsenal under the control of the other country. The similarity of the positions of the two states on this point was explained to the author by Indian and Pakistani experts as being based on two similar reasons:

- The capability of each of the two South Asian countries to build nuclear weapons is more or less clear to the other.
- India and Pakistan, which adhere to minimal nuclear deterrence, are not interested in nuclear competition or an arms race.

In addition, there has been a deep divergence of interests between India and Pakistan in nuclear arms control. India is more interested in controlling China's nuclear arsenals than in controlling Pakistan's.

China has shown no interest in exchanging data with India or in an agreement with India on limiting nuclear weapons. Pakistan would like to have an agreement with India on nuclear arms control, but India is not interested in an agreement with Pakistan.

The situation is slightly better in the area of confidence-building measures and communications that could be activated during crises to prevent an escalation of conflict. India and Pakistan have a number of agreements, namely:

- An agreement to prohibit attacks against nuclear installations and facilities, which requires the states to exchange lists of their respective nuclear installations on January 1 of each year (The India-Pakistan Non-Attack Agreement of 1998);
- An agreement requiring advance notification on ballistic missile tests (2005); and
- An agreement to reduce the risks from accidents related to nuclear weapons (2007).

It is very important to emphasize that none of these agreements has any verification mechanism (although some experts argue that they do include verification mechanisms). A window of opportunity to develop confidence-building measures opened at the time of the India-Pakistan Composite Dialogue in 2004 to 2008. The idea of this dialogue had been initiated by Pakistan in 1998 as part of a comprehensive proposal for a “strategic restraint regime.” Although in general, this proposal was not supported by the Indian side, some of its ideas were reflected in the Lahore Declaration of 1999, which stated for example: “[Both Governments] 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.”⁵³

The Composite Dialogue resulted in the 2005-2007 bilateral agreements on nuclear confidence-building measures. Following the Mumbai terrorist attack, however, this dialogue was frozen by India, which accused Pakistan of supporting terrorists working against India. Resumption of the dialogue on security and nuclear issues would seem to be a necessary step in advancing relations between India and Pakistan.

* * *

The existing nuclear standoff in South Asia is highly unstable. The geographic proximity of the conflicting sides to each other, their lack of adequate early-warning and combat control systems, as well as the still-inadequate survivability of delivery systems, create additional incentive to deliver a preemptive strike in order to disarm the adversary and prevent a nuclear response.

Both states could initiate a number of steps, including:

- Pursue greater transparency and symmetry in nuclear doctrines.
- Negotiate confidence-building measures with regard to nuclear and conventional forces (and also separately on missiles).
- Exercise mutual restraint in the development of nuclear weapons, and create verification mechanisms.
- Include the issues of Kashmir, nuclear security, and counterterrorism in the agenda of the Composite Dialogue.

More broadly, the Indian and Pakistani cases represent challenges to the nonproliferation regime. The nuclear-weapon states (chiefly the United States, Russia, and China) should demonstrate to these states their strong commitment to nuclear nonproliferation and disarmament, not only through the new START Treaty, but also through START follow-up, ratification of the CTBT, and finalizing the FMCT. India and Pakistan should be involved in the nonproliferation regimes on a nondiscriminatory basis (IAEA, NSG, MTCR, etc.). This involvement should not set a bad example to the nuclear threshold states. All advantages of nuclear cooperation must be made conditional on acceptance of NPT commitments and IAEA safeguards by recipient states.

NOTES

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CHAPTER 7

MISSILE TECHNOLOGY

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Despite its importance in strengthening regional and international security, the Missile Technology Control Regime (MTCR), implemented in 1987, has traditionally been in the rearguard of the arms control process. As analysts and politicians point to erosion of controls, missile capabilities continue to be perfected and missiles and missile technology proliferated around the world, increasing the potential for destabilization of the military and political situation both regionally and globally. For the most part, the threat of missile proliferation exists because of the increasing number of states that have gained access to missile technology, as well as the increasing attractiveness of missiles (and space carriers) for the country as symbols of advanced military capability and elevated international prestige.

This has been brought about by a number of factors.

First, regional and international tensions remain high, and there are military and political incentives for acquiring, developing, and perfecting missile technology. In this context, the acquisition of even a short-range missile capability may be seen as a way to establish regional military superiority.

Second, the possibility that a country might put nuclear warheads on its missiles means that it has acquired a limited nuclear capability, which for the leaders of states that are not capable to any significant degree of creating modern military forces may be seen as something of an “equalizer” to counter the far more advanced military machines of the developed countries. Also working in favor of this choice is the fact that regimes that have begun the development of even limited missile and nuclear capabilities or are only suspected of doing so enjoy the attention of the leading powers in the world, and from this are able to gain certain political and other dividends.

Third, access to missile equipment and technology, as well as to the information and techniques needed to build a missile capability, remains widely available.

Fourth, the nuclear nonproliferation regime has not been sufficiently effective.

Such factors negate the incentives that might otherwise induce enough countries to support the goal of making the MTCR universal and rendering it into a binding multilateral treaty.

The situation may be described as a kind of synergy between two military and technical processes, where nuclear proliferation creates a demand for missiles as the most effective means for delivering nuclear weapons, while missile proliferation provides the material base to give even a small nuclear capability not merely a regional, but perhaps even a global reach. At the same time, the proliferation of missiles presents a growing threat, not only because of their ability to deliver nuclear weapons or other weapons of mass destruction. New technologies that could conceivably become available to many countries in the foreseeable future would enable them to substantially improve the accuracy of their missiles and increase the effectiveness of using them against such critically dangerous facilities such as nuclear power plants (NPP). Aside from the NPPs, however, with modern cities characterized by high concentrations of industrial facilities dealing with hazardous materials, the explosion of even conventional warheads could cause damage equivalent to that of a WMD.

International Lines of Cooperation in Missile Development

In light of the factors listed above, over the past several decades many states have not only been importing missiles and missile technology, but also have succeeded in creating an indigenous, reasonably capable missile design and production base.

Long before the MTCR, a number of countries had established long-term ties in the area of missile engineering, where the technologically more advanced countries would conduct research and development work (R&D) under contract for nations that had the financial resources but lacked the science and manufacturing base. Production of the missile systems would, as a rule, begin

in the country pursuing the development, which would build and outfit missile production facilities while the other countries participating in the project were preparing the lines for their final assembly. The missiles would then undergo weapons tests in any country capable of carrying them out.

Missile development outside of the P5 powers has been seen to proceed using one of the following five main approaches:

First, the independent programs based upon previously acquired missile technology, which have no substantial technical influence upon the missile development programs of other nations:

- India's *Prithvi* and *Agni* missile development programs;
- Argentina's *Alacran* program, using technology developed under the international Condor II program based on French, German, Soviet, and U.S. missile technology obtained both legally and illegally;
- Egypt's *Sakr 80* program, which is supposed to address the country's need for a nationally-produced, solid-fuel missile based on French and Soviet technologies;
- Turkey's missile program, which focused on producing a series of tactical (potentially, intermediate-range) ballistic missiles by adapting modern electronics and solid-fuel engine technologies to its missile production industry;
- South Korea's program, which it has pursued through the continued development of previously acquired U.S. missile technology.

Second, the relatively independent programs operated autonomously, which initially relied on foreign missile technology and do have a significant influence on the programs of other countries:

- Israel's Jericho program, under which it has accumulated a substantial amount of technical expertise in missile production and which has had a significant influence on South Africa's Arniston program and also to a certain degree on Taiwan's Sky Horse program;
- Iran's programs, which began with the use of technology and direct shipments from North Korea (and to a lesser extent China), and then shifted to the use of predominantly indigenous designs;
- Brazil's programs, under which technological expertise was gained in adapting U.S. and Soviet technologies that is now being transferred to other countries.

Third, the basic programs, designed to develop missile weaponry both for the needs of the country itself and for export:

- China's programs to develop M-Series missiles;
- North Korea's missile production programs, based upon the use (and, with the assistance of Chinese specialists, the enhancement) of Scud-type liquid-fuel missile technologies that have had an influence on the missile programs of Iran, Libya, Syria, and other countries.

Fourth, the programs that are mostly independent, which are operated largely by the countries themselves but nevertheless rely on imports of key missile technologies:

- Taiwan's Sky Horse missile program, run by the country's domestic missile production industry with technological "pump priming" from Israel;
- Spain's *Capricorno* program, which, analysts believe, implements missile technology developed under Argentina's Condor II missile program.

Fifth, fully dependent programs that rely almost entirely on the success of the missile programs of other nations:

- Pakistan's *Hatf* program, essentially a domestic offshoot of China's Series M solid-fuel missile program;
- Egypt's Scud missile modernization and Project T domestic missile development programs, pursued with the technical assistance of Chinese and North Korean specialists and dependent upon North Korea's missile production programs;
- Libya's *Al Fatah (Iltisalt)* Scud modernization missile programs and other missile programs, conducted largely by foreign specialists using Chinese, German, North Korean, and Soviet technologies;
- Syria's missile program, being implemented with the technical assistance of Chinese and North Korean specialists;
- South Africa's Arniston program, based upon Israeli missile technology.

Thus, in developing their domestic missile production capabilities, many countries have come to rely less on imported missile systems and missile technology, although for many of the newer technological components the role of import remains quite important.

The missile programs of Iran and North Korea remain a topic of particular concern for developed countries. On February 2, 2009,

Iran launched its first national satellite, the *Omid*, aboard a *Safir II* liquid-fueled booster. This launch was significant primarily in demonstrating to the world that Iran had achieved a level of technological capability that allowed it to produce two-stage (and potentially three-stage) ballistic missiles and artificial satellites.

These points were emphasized in an official statement by the U.S. Department of State, which stressed that “Iran’s development of a space launch vehicle (SLV) capable of putting a satellite into orbit establishes the technical basis from which Iran could develop long-range ballistic missile systems.”¹ However, some U.S. and Russian experts continue to dispute the idea that Iran has made a “fundamental technological breakthrough.”²

In May 2009, Iran tested the *Sejil II* missile, having a significant range of over 2,000 kilometers. Iran trumpeted this as another great achievement. Iran has been constantly provoking the international community with news of the successful testing of long-range missiles (one of the latest cases was in December 2011). However, only eight years earlier (in October 2004), Iran had also claimed to have succeeded in extending the range of its *Shehab III* missiles to 2,000 to 3,000 kilometers, as well as in developing the two-stage *Shehab IV* missile. It was also claimed that Iran had two versions of the *Shehab* missile under development that would have even greater range (over 4,000 kilometers); these were to be the *Shehab V* and the *Shehab VI*.³ In light of the absolute secrecy that surrounds Iran’s missile and nuclear programs, as well as the policy pursued by the Iranian leadership that has brought about heightened tensions with the rest of the world, it can be difficult to draw a line between the actual situation in the country’s missile and nuclear sectors, and the Iranian leadership’s PR actions attempting to elevate the country’s prestige and gain a better hand at the negotiating table.

North Korea’s missile capabilities have been developed with active assistance from China. According to available information, the country currently has in its inventory an extended-range tactical Scud-C missile. First built in 1989, this single-stage liquid-fueled missile is capable of delivering a 750-kilogram payload over a distance of 600 to 650 kilometers.

The *Nodong I* (or Scud-D) missile was developed with the participation of Iran and Libya, which used middlemen to buy the necessary materials and technical equipment in Western countries. Its maximum range is between 1,300 and 1,500 kilometers with a pay-

load of 700 to 1,000 kilograms. The *Nodong II* IRBM deployed later has an extended range of over 2,000 kilometers.

North Korea currently has more than 1,000 ballistic missiles on active duty, including between 670 and 690 Scud missiles of various types and around 320 intermediate-range *Nodong* missiles.⁴ At various stages of development and testing are the *Taepodong I* (a three-stage variant of the *Nodong II*) and *Taepodong II* missiles (with a range of between 6,000 and 8,000 kilometers and payload of up to 1,000 kilograms). On April 5, 2012, North Korea launched its *Taepodong II* missile in what was described as an attempt to put a satellite into low earth orbit, but the launch was unsuccessful.

North Korea's missile capabilities are currently more imposing than Iran's, and, moreover, are reinforced by its inventory of several nuclear warheads. While a first use of missiles or nuclear weapons by North Korea would clearly be suicidal for it and its leadership, its missile capabilities (combined with its nuclear weapons) are more than adequate for maintaining tension in relations with its neighbors and the global community as a whole and raising the specter of an outside threat, which works to keep the current regime in power and achieve its goals during negotiations.

Naturally, the world's leading countries (in particular the United States and Russia) are quite concerned about the military capabilities of Iran and North Korea. Analysis, however, has indicated that such concerns have arisen primarily as a result of factors that are less related to missile capabilities and equipment as such, than to the confluence of a number of factors: the existence of a missile capability; the availability of nuclear weapons (or the suspicion that such are being developed); and the nature of the ruling regime and the policies it pursues.

At the same time, any attempt to force regime change (as the United States and its allies have done in Iraq) would only destabilize the situation further at both the regional and international levels.

The MTCR and Efforts to Improve It

The Missile Technology Control Regime (MTCR) was established over two decades ago at the initiative and with the participation of the Group of Seven (G7) leading industrialized states (Britain, Canada, France, Germany, Italy, Japan, and the United States,) in or-

der to reduce the threat of nuclear proliferation. At present, 34 countries are party to the regime, including Russia. However, the fact that states that have particularly suspicious political and military intentions continue to avoid joining the MTCR is cause for serious alarm.

The documents defining the structure of MTCR controls are the MTCR Guidelines for Sensitive Missile-Relevant Transfers and the MTCR Equipment, Software and Technology Annex, which lists goods as belonging to one of two categories, based upon type of control. This regime is not binding; MTCR rules are adopted voluntarily by nations that share the goals of missile nonproliferation.

The goal specified as being most important in the Guidelines is to “limit the risk of proliferation of weapons of mass destruction ... by controlling transfers that could make a contribution to delivery systems.” The Guidelines are also intended “to limit the risk of controlled items and their technology falling into the hands of terrorist groups and individuals.”⁵

Controls must be applied with respect to the items listed in the Annex to the Guidelines, with the question of whether or not to allow shipment to be decided separately in each individual case. The Guidelines are implemented in each country as national statutes.

National lists of controlled items and the specific systems subject to control under such lists are derived from the Technical Annex adopted and regularly updated at the international level. However, the specific manner in which the MTCR controls are actually implemented quite often provokes sensitive conflict situations relating to the nature and intent of the shipments.

For example, the U.S. administration famously filed a complaint with Moscow in 1992 after Glavkosmos had signed a deal with India to deliver a number of cryogenic rocket boosters for India’s GSLV space carrier; the United States succeeded in having the Russian shipments terminated in 1993. In 1998, Washington imposed sanctions against 10 Russian companies alleged (but not proven) to have participated in establishing Iran’s missile capability (the *Shehab* class of missiles),⁶ and the U.S. government raised complaints several years ago about the activities of a number of Russian companies that, although they had not violated the MTCR, had from the American point of view nonetheless put “Russia’s ability to implement controls on missile related technologies”⁷ in doubt.

When Russia accused Ukraine of illegally exporting X-55 cruise missiles to Iran and China, the case was widely reported. The details

of this case were quite indicative of the general state of the MTCR itself. Ukraine's minister of foreign affairs first stressed that the country had legally transferred X-55 missiles only to the Russian Federation. However, he was forced to admit that Ukrainian security agencies had earlier uncovered an operation by a certain "international criminal group" attempting to smuggle these missiles to China and Iran, as had been reported at a previous plenary meeting of the MTCR.⁸

China itself has repeatedly fallen under Washington's critical fire. In a U.S. State Department report on compliance with arms control, nonproliferation and disarmament treaties and commitments, Beijing was called a serious violator of the MTCR, and its leadership was accused of providing Iran, Pakistan, and North Korea with controlled materials and technology that enabled "the development of missile programs in violation of the Chinese government's commitment to missile nonproliferation."⁹ Representatives from both China and Russia disagreed with these assessments of the activities of their respective countries.

China submitted an application for MTCR membership in 2004, and then again in 2008, but it remains unapproved by the member states. This situation and the points mentioned above represent but a few examples of the continual mutual accusations of violating the MTCR and underscore the need for a system that could settle such disputes in an authoritative and impartial manner.

MTCR limitations are based upon the idea that each country would enforce the restrictions in its national list of controlled items, which would be adjusted to match an overall list that has been agreed to at the regular plenary meetings. On the whole, the MTCR is built around the principle of voluntary implementation by each government of the understandings it has agreed to as to what may or may not be exported. However, there is little doubt that one regime member's estimation of the missile and space program intentions of a recipient nation may not be shared by other member countries.

After a number of years of practical application, the regime has been found to have other shortcomings as well. For example, not every member state shares information on its national control list fully and expeditiously. The process of adapting these lists to match the decisions made at MTCR plenary meetings is time consuming. Additionally, there are obvious differences in the way the negotiated controls are interpreted and enforced at the national level.

Over the years of its existence, unfortunately, the MTCR has not succeeded in preventing access to missile weaponry by a number of countries, in particular those that have pursued and continue to pursue policies of deep concern to the world community (Iran, Iraq, and Syria). Moreover, only a sixth of the countries of the world have joined the MTCR during the more than 20 years of its history. There are, for example, only three regime members (Japan, South Korea, and Turkey) to represent the enormous Asian region, where the “missile threat” is high.

Attempts to reinforce (or rather, to “patch”) the regime were made at the above-mentioned annual MTCR plenary sessions, and have continued at the respective meetings of recent years.

The plenary meetings of 2006 and 2007 in Copenhagen, Denmark, and Athens, Greece, respectively, continued the process of clarifying technical control parameters. It is worth noting that the MTCR has increasingly been viewed at such sessions in the broader context of security. During the Athens session, for example, particular attention was paid to the correlation between the MTCR and the requirement for strict observance of United Nations resolutions relating to the nonproliferation of WMDs.

In this specific case, the session underscored the direct relationship between the export controls and UN Security Council Resolution 1718 on North Korea, and UN Security Council Resolutions 1737 and 1747 on Iran. The MTCR partners appealed for all possible national and international measures to be taken in order to ensure the full and effective implementation of these Resolutions,¹⁰ primarily in response to the concern expressed by the United States and a number of other developed countries about Iran’s growing missile capabilities and the need to control them. The plenary meeting also confirmed its support for the now-famous UN Security Council Resolution 1540, which declared the proliferation of weapons of mass destruction and their means of delivery a threat to international peace and security and required all UN member nations to implement effective export controls.

The session also addressed another important objective by supporting efforts to engage non-members in the MTCR in mutual cooperation. The United States was a key state backing this policy, with the Russian Federation also expressing support.

In 2008, within the framework of the “package agreement” reached under the 2007 “nuclear deal” between India and the United States

(which had removed restrictions on providing India with U.S. equipment and technology for its civil nuclear industry), India joined the list of states that have unilaterally committed to observe MTCR regulations.¹¹

As the Indian example again demonstrates, simple appeals will not be enough to strengthen the MTCR or enhance international security overall. Frequently, so-called “positive incentives” are called for in order to turn a nation’s policy in the necessary direction. On the whole, however, the number of participants in the regime is growing at an exceedingly slow rate, which clearly fails to match the rates and opportunities that exist for the proliferation of missiles and missile technology.

At the 23rd MTCR Plenary Meeting in Canberra, Australia, on November 5-7, 2008, the member countries devoted particular attention to issues related to the proliferation of WMDs and their delivery means, separately underscoring the importance of the challenges that face the MTCR in Northeast and South Asia and in the Middle East. Numerous proposals were discussed, aimed at improving the reliability and universal nature of MTCR controls. The participants came to agreement on the measures that must be implemented at the national level in order to improve the effectiveness of the MTCR.

In light of the ongoing concerns, representatives from the participating countries felt compelled to underscore the direct relationship between all of the UN Security Council resolutions on Iran (including Resolutions 1803 and 1835, adopted in 2008) and the export control measures of the MTCR, expressing the intent to exert every effort both to expedite the implementation of these measures and to prevent the transfer to other nations of any objects, materials, items, or technology that could aid the spread of WMDs and missile programs for their delivery.¹² The participants in the meeting reaffirmed the importance of Resolution 1540, and supplemented and amended the Technical Annex as usual.

The 24th MTCR Plenary Meeting in Brazil on November 10, 2009, continued the technical improvement of the regime’s control parameters and introduced amendments and supplements to several sections of the Annex.

The great amount of detail that was presented at the plenary meetings by experts trying to improve the control regime has not tangibly decreased the violation level or the number of mutual accusations filed in this regard. The examples of such allegations that were

presented above serve as only partial evidence that countries raise claims about MTCR compliance quite frequently, but face serious difficulties in having them considered objectively.

The case of Ukraine, where missile equipment was illegally transferred by a group of people rather than by a state, presents a unique situation. If an international criminal group could obtain such equipment with the intent to sell, then that would actually confirm the validity of the fear that a terrorist group could acquire missiles to carry out terrorist acts. Considering the potential threat to international security that this would represent, far deeper and more effective controls are needed to cover every possible means of missile proliferation.

This unsatisfactory missile proliferation situation was one of the factors that compelled the MTCR membership to offer an initiative in the form of a document titled the International Code of Conduct Against Ballistic Missile Proliferation (ICOC), which was adopted in November 2002 in the Hague and signed by 93 nations; thus far, the ICOC has been joined by over 120 nations.

Unlike the MTCR, the ICOC (hailed as a step forward in developing the MTCR Guidelines) is a political document. It proclaimed the need to prevent and deter missile proliferation and the importance of strengthening disarmament and nonproliferation regimes, and called for transparency in national missile programs. One important provision of the ICOC was the appeal for cuts in the national stockpiles of such missiles in the interest of global and regional peace and security, a more radical step than merely recommending the limitation of missile capabilities and exports.¹³

Particularly relevant was the decision to create an appropriate mechanism for the voluntary resolution of disputes related to national declarations; the lack of such a mechanism (which continues to the present day) was mentioned above as one the major shortcomings of the MTCR.

The ICOC provides for an exchange of advance notifications of launches and test flights of ballistic missiles and space missile carriers. It appears exceptionally important that the ICOC emphasize the connection between space research programs and military ballistic missile development.

Nevertheless, Russia's proposal to make the ICOC legally binding did not win support (nor did U.S. proposals to provide the MTCR with a number of supranational functions, which Russia opposed).

Despite continuing efforts to improve the MTCR, its shortcomings have so far proved impossible to eliminate. It would appear that they are of a systemic and organizational nature, exacerbated by political disputes among the participating countries.

The Prospects For Improving the Effectiveness of the Missile Nonproliferation Regime

The existing system for limiting the proliferation of missiles and missile technology has been unable to efficiently counter the creation of launchers that could be used to deliver nuclear weapons or other weapons of mass destruction, particularly by countries ruled by unpredictable regimes. Such countries can acquire missiles and missile technology either through foreign deals or domestic development. Yet the first efforts to implement additional safeguards in this process (beyond the MTCR) were made over a decade ago (in 1999), when the president of Russia proposed the idea of a Global Control System (GCS).

The concept behind this system incorporated a number of transparency measures, including a voluntary promise to provide information on upcoming and completed ballistic missile and space program launches. As an incentive for countries to agree to cut or abandon their armed missile capabilities, it was proposed that they be rendered assistance in developing their national space programs. One important element was the promise to guarantee the security of nations that have renounced their right to have missile delivery systems. However, the fact that Russia had proposed this system as a counterweight to the U.S. plans for a national missile defense system predetermined its negative reception in Washington.

Subsequently, proposals to make the MTCR and ICOC legally binding would occasionally appear at some level. In particular, among recent initiatives was the recommendation made by several dozen distinguished global scholars and experts in the May 2007 Declaration of the International Luxemburg Forum on Preventing Nuclear Catastrophe to immediately commence consultations on elevating the status of both the MTCR and the ICOC.¹⁴

At the same time, it must be admitted that there have been some serious problems along this path that have yet to be resolved. Legally binding arms limitation treaties and agreements generally have a ro-

bust set of controls over compliance with their provisions. In this respect, the United States and the Soviet Union/Russia have amassed a wealth of experience within the framework of treaties such as START and the INF in developing control systems and confidence-building measures with regard to ballistic and cruise missiles. These treaties, however, cover only a limited class of missile systems with fixed deployment schemes, types of launchers, command centers, and other missile infrastructure facilities.

By contrast, the MTCR includes, aside from ballistic missiles, a huge list of cruise missiles of all deployment modes and unmanned aerial vehicles (UAV). With respect to the latter, the advanced modern technologies in the field of materials, engines, and control and guidance systems have led to such a diversity of type, size, and weight characteristics (all the way to miniaturized) that the problem of creating a workable system of controls (including export controls) appears at present to be almost unsolvable; however, it is control difficulties that are most often cited as arguments against joining treaties and agreements. Examples of this are the U.S. refusal to join the proposed treaty against weapons in space, and the dead end reached with the FMCT and to a certain extent with the CTBT.

Relatively fewer difficulties threaten the development and approval of a system of controls for the Code of Conduct Against Ballistic Missile Proliferation, should it ever be made a legally binding agreement. Even this, however, would mean addressing a variety of missile classes and deployment types.

Under such circumstances, a number of methods could be considered for improving the missile nonproliferation regime, from elevating the status of the ICOC and the MTCR separately to developing a draft treaty that combines these two documents into one. In either case, however, considering the problems cited above with control mechanisms, the usual treaty ratio of control systems to confidence-building measures must be adjusted with a greater emphasis on the latter. This means that verification of compliance with the provisions of these treaties (or agreements) could to a significant degree be accomplished through exchanges of information on national missile development programs and planned launch schedules, and by displaying missiles, launch systems, and other components of missile infrastructure, allowing observers to access the facilities, and taking other confidence-building measures.

The effectiveness of the new treaty could be improved by including measures limiting missile system production and ensuring the physical security of missile systems in order to prevent them from falling into the hands of terrorist groups (this especially concerns cruise missiles and UAV.) A regularly updated list of restricted missile systems and their parameters could be included as an annex to the treaty. This annex could come in the form of a fundamentally new version of the existing Technical Annex to the MTCR Guidelines that not only includes restrictions on specific parameters of missile systems and technology, **but also on specific types of existing missiles and those under development.**

This treaty could also include many existing concepts that have not yet **found application (for example, making it absolutely mandatory to issue notification of all missile and space program launches, and release information on existing arsenals of ballistic and cruise missiles with certain characteristics).** In addition, the treaty could help to implement the idea of extending such restrictions to cover not only the suppliers, but also the recipients of missile technology.¹⁵

The proposed treaty could also find new supporters beyond the participants in the MTCR, since some countries may find it to their benefit to **join the regime together with neighboring countries** whose missile capabilities raise mutual concern.

At the same time, it would be appropriate to begin (in advance and with a view to the long-term) preparation of a broader draft treaty that would integrate provisions of the MTCR, the ICOC, and the Global Control System (GCS) into a new global, legally binding missile and missile technology nonproliferation regime similar to the NPT. A regularly updated list of restricted missile systems and their characteristics could be included as an annex to the treaty, **containing all of the technical definitions for the subject of the agreements, control and confidence-building measures, mechanisms for verification and detection of violation, sanctions for violations, and ways to resolve disputes.**

One circumstance that greatly complicates the effectiveness of the missile nonproliferation regime is the fact that, no matter what the current or future status of the agreements above, the countries that represent the greatest threat for this regime are members of neither the MTCR nor the ICOC and would hardly be likely to join in the new documents. Iran and North Korea are prime examples.

North Korea has periodically been pressured at the Six-Party talks to limit its **missile program in connection with nuclear crisis resolution**, and this approach may yet prove to be of promise in light of the social and economic situation in the country. No such linkage, however, exists in the case of negotiations on the Iranian nuclear program. Therefore, no matter how Tehran reacts to the UN Security Council resolutions **demanding an end to its uranium enrichment program, the agenda of negotiations with Iran must include renunciation of its programs for developing and testing intermediate-range missiles and ICBMs.**

This restriction is also vitally important from the standpoint of reaching accord between the United States and Russia over plans to deploy U.S. BMD to defend Washington's allies in Europe and in other regions of the world, particularly considering the fact that this dispute has complicated the already difficult process of consolidating efforts by Washington and Moscow to **counter the spread of missiles and nuclear arms. On the whole, it would appear quite reasonable to link the BMD issue more closely with the problem of missile proliferation.**

Since negotiations on a number of basic points (such as joint assessment of potential missile threats) are yet ongoing between the United States and Russia, to develop a set of limits on missile proliferation would be quite difficult.

Considering the fact that North Korea is geographically closer to Russia than it is to the United States, Moscow's reaction to North Korea's withdrawal from the NPT in January 2003, its large-scale missile launches and its nuclear tests could have been expected to be much sharper; however, that is not the way it turned out. While Japan and the United States have long considered the very nature of the North Korean regime and their hostile relations with it to be important aspects of the threat emanating from that country, this is not the case with China and Russia, which have pursued relatively friendly relations with Pyongyang and so do not see its missile and nuclear programs as a direct national security threat, although they admittedly present a significant foreign policy problem (the same, incidentally, **applies to the U.S. approach to the nuclear and missile programs of Pakistan.**) Commenting on missile tests carried out by North Korea in recent years, a representative of the Russian Ministry of Foreign Affairs expressed some concern, noting that such behavior worked counter to regional stability.¹⁶ At the same

time, however, some deputies of the State Duma and many foreign policy experts have contended that Pyongyang's actions stem from fears of regime change by force.

As in a number of other important areas of contemporary military technical and political development, the proliferation of missiles and missile technology has generated a tangle of problems for the future of nuclear nonproliferation.

The influence that the proliferation of missiles and nuclear weapons has had on the **commitment of the great powers to further nuclear disarmament** is in contradiction to the provisions of Article VI of the NPT on the responsibilities of the nuclear powers. Moreover, divergences in the positions of Japan, the European Union, Russia, and the United States over the threat levels posed by states with unstable or totalitarian regimes continue to impair efforts to enhance the missile nonproliferation regime.

The speed and nature of developing contemporary challenges and threats related to missile proliferation call for a consolidated and effective counteraction by the leading world powers, which presupposes a speedy resolution of disagreements in the area of enforcing missile nonproliferation. Only in this way can the appropriate conditions be established for reinforcing this regime of "horizontal disarmament," so important for regional and global security.

The possibility of U.S.-Russian joint action is of key significance for this process. The low effectiveness of the MTCR to the present day can largely be traced to the **political disputes that have periodically emerged in relations between the two countries**. Only by establishing stable and close bilateral cooperation can the MTCR's current poor effectiveness be fundamentally improved. Hopes that such cooperation might be possible have been raised by the signature of the New START Treaty, which represents a rapprochement of **positions between the two states over a wide range of international security concerns**.

NOTES

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CHAPTER 8

NUCLEAR TERRORISM

Alexander Pikayev

The worsening problem with terrorism at the beginning of the 21st century has attracted increased attention from both government and non-government experts on the danger of nuclear materials or even warheads or nuclear explosive devices falling into the hands of terrorists. A number of studies have been undertaken to evaluate such threats and to determine how best to prevent them, and a series of measures have been implemented at the national, multi-national, and global levels. Yet despite the relatively strong international cooperation in this area, the positions of the leading powers remain conspicuously divergent, as may be seen from the doctrinal documents adopted in Russia and the United States between 2008 and 2010 (the Foreign Policy Concept of the Russian Federation, the National Security Strategy of the Russian Federation to 2020, the Military Doctrine of the Russian Federation and the Nuclear Posture Review of the United States).

Possible Scenarios

Based upon the threat analysis, most experts have concluded that the acquisition or creation of a nuclear weapon by a terrorist group, though possible, **would not be very likely**. **The greatest risk is associated with the potential use of a radiological weapon, a “dirty bomb.”** Under such a scenario, radioactive substances would be assumed to disseminate over an area and cause contamination. Although that might not cause a great number of fatalities, the resultant economic damage could be substantial and require a long time and significant expenditures to overcome.

Terrorists might also be drawn to the idea of attacking or **destroying** a nuclear facility in order to contaminate an area with radioac-

tivity by creating a “deliberately inflicted” accident. Of course, such facilities are well guarded, and would take specialized knowledge to subvert; nevertheless, the number of forces required to counter such an eventuality would be quite considerable.

The use of a nuclear explosive device for terrorist purposes would have catastrophic consequences both in the huge numbers of casualties and in the scale of destruction. Thus, however improbable it may appear for terrorists to acquire or create a nuclear explosive device, the possibility should never be discounted fully.

Experts believe that there are several methods that terrorists groups could use to acquire a nuclear explosive device, one being by stealing weapons-grade materials. Although military stockpiles of these materials are generally well guarded, such a scenario could still conceivably occur in a state having such materials if its domestic situation is unstable or if workers at nuclear facilities become complicit.

Non-military stocks are felt to offer terrorists the greatest opportunity for acquiring nuclear materials. Such materials are more broadly available (including in non-nuclear states), and are less well protected. They are not weapons-grade *per se*, but their level of enrichment is presumed to be sufficient to create a primitive nuclear explosive device. In particular, serious concern has arisen with regard to the stockpiles of highly-enriched uranium used as fuel for research reactors in many countries. Efforts have been made over the past decade to have them repatriated to the country that manufactured them (typically Russia or the United States), but these efforts are far from completion.

Terrorists can also acquire highly-enriched or weapons-grade materials from corrupt government officials, or even from governments facing serious financial difficulties. North Korea, **which has an economy that teeters on the verge of collapse and which has been accused of using criminal methods¹ to obtain additional income**, is sometimes named as a possible source.

A number of experts feel that low-enriched materials also present a threat. The measures used for securely storing such materials are substantially less strict than those used for highly-enriched military or **civil nuclear materials, which makes them much easier to access**. True, **to enrich such materials to the needed level would involve an extremely complicated and costly technical process that requires expensive equipment, highly qualified personnel, and technical expertise**. To conceal such activities from law enforcement

would be practically impossible. Still, such enrichment could theoretically occur within the territory of a “failing” state. Neither can the possibility of government authorities voluntarily or involuntarily cooperating with terrorists be dismissed. Government officials might either share the goals of terrorist groups and consciously help them, or they might simply turn a blind eye to such activities, for example, due to corruption or blackmail.

As has already been noted, the least likely scenario involves a terrorist group acquiring a nuclear explosive device. Even in this case, however, there are several potential scenarios that would have a greater-than-zero probability of occurring.

For example, domestic instability in a country possessing nuclear weapons could result in weakened security measures with respect to its nuclear arsenal and could also create an atmosphere favorable for the formation of large, well-organized, and armed terrorist groups that would be capable of attacking and capturing a nuclear munitions storage facility. An attack and theft of nuclear munitions could also be facilitated by accomplices among the staff and security personnel at the facility.

Another potential risk of a deliberate transfer of nuclear explosives to terrorists might arise were a fundamentalist or radical regime to take power in a country with nuclear weapons. This could be done out of ideological sympathy for the terrorists, or for the purpose of carrying out a subversive campaign against an adversary. The opposite is also possible: the disintegration of a nuclear state can lead to chaos and loss of control over its nuclear weapons.

The deployment of nuclear weapons in one country by another can also involve serious risks. U.S. B61 bombs, for example, are stored at Incirlik Air Base in Turkey, near a major zone of Kurdish insurrection. Of course, the fact that a base is located near an area of instability does not automatically make it vulnerable to terrorist attack. Still, during the peak of the Chechen conflict in the mid-1990s, the United States insisted that Russia concentrate its nuclear warheads at a smaller number of nuclear storage facilities. During the same period, Moscow decided to transfer its strategic bombers from their base at Mozdok in North Ossetia near the war zone to a location deeper in the country.

It is also worth noting that the threat of nuclear terrorism is closely related to the proliferation of nuclear technologies, materials, and arms. The greater the number of states that have them,

the greater the probability of their unsanctioned use, including by terrorist groups.

The U.S. 2010 Nuclear Posture Review

The nonclassified results of the U.S. 2010 Nuclear Posture Review published on April 10, 2010,² contain significant new elements for assessing nuclear threats to the United States. For the first time for this type of document, it lists the main threats to U.S. security as nuclear terrorism and the proliferation of nuclear weapons. At the same time, the document does not stop at simply identifying the danger, but contains a fairly detailed program for combating these threats as well.

It alleges that Al Qaeda and its “extremist allies” are seeking to acquire nuclear weapons, and that if they had them, they would use them. Although terrorist groups do not **currently have the resources** to produce weapons-grade materials on their own, the fact that nuclear materials remain extremely susceptible to capture or theft, **together with the availability of sensitive equipment and technologies** on the nuclear black market, creates a serious risk that terrorists will be able to **acquire everything they need to build a nuclear weapon**.

The document mentions three ways to prevent the proliferation of nuclear weapons and avert threats of nuclear terrorism. First, the United States will seek to bolster the nuclear nonproliferation regime and its cornerstone, the NPT. In order to further this goal, the United States must work to block the nuclear ambitions of Iran and North Korea, strengthen **IAEA safeguards and enforce compliance** with them, establish barriers to the illegal trade in nuclear items, and promote the peaceful use of nuclear energy in a way that avoids creating additional risk of proliferation. The second element is the active pursuit of the implementation of President Barack Obama’s initiative to ensure reliable security for all vulnerable nuclear materials worldwide within four years. Finally, the third element involves **further arms control initiatives**. Aside from finalizing the new Strategic Arms Reduction Treaty signed in April 2010, the proposed measures also include Senate ratification of the Comprehensive Nuclear Test Ban Treaty and its entry into force, and negotiation of a verifiable Fissile Material Cut-off Treaty.

The document presents four key administration goals in the war against nuclear terrorism, **based primarily on national and international initiatives and documents adopted under the Bush administration.**

The first goal is the active pursuit of President Obama's Prague initiative to secure all vulnerable nuclear materials worldwide within four years, which was supported by UN Security Council Resolution 1887. The funding suggested for these purposes for fiscal 2011 was 2.7 billion dollars, a 25 percent increase over the previous year.

In effect, the Prague initiative represents an attempt to speed up implementation of a number of decisions adopted under the Bush administration. One of these was **the Global Threat Reduction Initiative**, which called for reliable security measures to be implemented at the world's vulnerable nuclear materials stockpiles. In addition, it stipulated the repatriation of highly-enriched uranium of U.S. and Russian origin from research reactors worldwide, and the conversion of the reactors themselves to operate on fuel that would be more difficult to use for producing a nuclear explosive device.

Another earlier decision was the International Nuclear Material Protection and Cooperation Program, **intended to reinforce security measures at Russian nuclear weapons complexes.** It has been proposed that the application of this program be redirected to other countries beyond the borders of the former Soviet Union.

Finally, the Obama administration **has announced the goal of institutionalizing the Global Initiative to Combat Nuclear Terrorism**, adopted in 2006 by the presidents of Russia and the United States and currently listing 83 nations. This initiative stipulates that the work of experts be coordinated, information be shared, and capabilities be integrated to deter, detect, interdict, and neutralize acts of nuclear terrorism.

The second goal is to **reinforce national and international capabilities in countering the nuclear black market and intercepting nuclear contraband materials.** For these purposes, the United States intends to work to reinforce national and multilateral regimes of export and border controls, to provide funding and undertake other measures to **counter the illicit trade in nuclear materials and technology**, in particular technology relating to uranium enrichment and plutonium production.

This is a requirement of the unanimously adopted UN Security Council Resolution 1540. Washington intends to expand the assis-

tance it provides to other nations to implement the provisions of this document. In particular, it supports the idea of creating a special United Nations fund to finance compliance with the Resolution.

In an effort to counter **the illicit nuclear trade, the Obama administration** has pledged to institutionalize the Proliferation Security Initiative (PSI), created in 2003 as an informal group of over 90 countries joining efforts to intercept illegal shipments of cargo associated with weapons of mass destruction.

In parallel, the second **goal stipulates measures to be taken to assist** in the peaceful use of nuclear energy by other countries without increasing the risk that highly-enriched or weapons-grade materials would fall into the hands of terrorists. The proliferation of closed fuel cycle **technology (which is not banned under current nonproliferation regimes)** increases the availability of such materials and, consequently, the risk of their unsanctioned use (including use by terrorist groups).

These efforts are also being implemented through the Global Nuclear Energy Partnership formed previously, **which has 25 partner states and 31 observer countries participating.**³ This Partnership aims to reduce the incentives for a country to pursue its own fuel cycle development by internationalizing the process. Thus, the most sensitive elements of the cycle (**uranium enrichment and spent reactor fuel reprocessing**) would be carried out in countries that already possess such technology.

The Nuclear Posture Review supports initiatives on the establishment of international nuclear fuel banks, including the Russian plan to create an international uranium enrichment center in Angarsk. The document also speaks of the need to pursue development ideas for an international system of fuel supply guarantees, and to conclude agreements with the supplier countries on the return of spent fuel and the construction of repositories for spent fuel storage, and it reiterates the willingness of the United States to continue to assist countries in other aspects of the peaceful use of nuclear materials, including for agricultural and medical purposes and pure research.

The second **goal also provides for continuing and expanding the activities** pursued under three other programs, the Container Security Initiative (which includes the task of scanning U.S.-bound cargoes), and the Second Line of Defense and the **Megaports programs (installation of radioactive substance detectors at border control points, airports, and seaports).**

The third goal is to **carry out a national research and development** program aimed at achieving a nuclear-free world, including research into control and verification technologies and measures aimed at improving transparency.

Finally, the fourth goal is to reassert the commitment of the United States to **bring to justice any country, terrorist group, or other non-government structure that has helped terrorists obtain or use weapons** of mass destruction in any way. For these purposes, the United States will develop its so-called nuclear forensic measures so as to be able to identify the source of nuclear materials intended to be used (or actually used) to produce a nuclear explosive device.

The fact that the United States has identified nuclear terrorism as its overriding security concern, one that predominates over other aspects of nuclear policy, such as disarmament and nonproliferation, may be seen as a breakthrough that improves the prospects for international cooperation (including between the United States and Russia) in countering the threats of the 21st century, including the threat of nuclear terrorism.

Another **strong point of the document was its inclusion of a very detailed** program for combating nuclear terrorism. Instead of proposing yet another set of high-fanfare initiatives, it emphasized accelerating and expanding implementation of already existing decisions. This underscores the bipartisan consensus in Washington on the urgency of the terrorism threat.

The Review's shortcomings include the lack of any proposals for establishing a mechanism to coordinate the implementation of the numerous but separate initiatives that were adopted **over the previous** decade; nor does it provide detailed proposals to expand or transform them.

The Review identifies the potential sources of nuclear terrorism rather narrowly. In the opinion of the authors, the threat comes only from Al Qaeda and its "extremist allies." Thus, other potential sources of terrorism have been excluded, and this can only damage efforts to combat them. Moreover, North Korea and Iran have been presented as nothing short of the greatest security threat facing the country.

Although the document did recognize the need for international cooperation in combating nuclear terrorism, it nonetheless devoted insufficient attention to the problem of reinforcing the international legal regimes that apply in such cases. In recent years, significant efforts have been made **in this sphere; however, the current docu-**

ments (the 2005 International Convention for the Suppression of Acts of Nuclear Terrorism, for example) do not apply universally and frequently contain vague provisions that provide an opportunity for abuse. **Their compliance monitoring procedures are also inadequate and lack mandatory enforcement mechanisms.** Besides, many countries have had trouble meeting their commitments due to a lack of sufficient resources and expertise.

The Russian Doctrinal Documents From 2008 Through 2010

During the period from 2008 through 2010, Russia adopted three fundamental doctrinal documents: the Foreign Policy Concept of the Russian Federation (approved on July 12, 2008), the National Security Strategy of the Russian Federation to 2020 (approved on May 12, 2009), and the Military Doctrine of the Russian Federation (approved on February 5, 2010). None of these documents contained the term “nuclear terrorism,” nor were there any measures detailed to oppose it. Still, all three documents do devote some attention to the problem of countering terrorism as a whole, and some of their provisions do show **Russian concern about the threat of nuclear terrorism and the vulnerability of its hazardous (including nuclear) materials and facilities.**

The National Security Strategy of the Russian Federation to 2020, provides the most detailed proposals for combating terrorism of the three documents, with the problem addressed explicitly or indirectly in 13 of the Strategy’s 112 points.

According to Point 10 of Article II (“Russia and the Modern World: Current Conditions and Development Trends”), “the threat of the proliferation of weapons of mass destruction and of their falling into terrorist hands” will have a “negative impact” on “ensuring national interests of the Russian Federation.”

The document also mentions the vulnerability of hazardous materials and facilities. According to Point 12, “the critical physical condition of hazardous materials and facilities” may lead to the “intensification of existing regional and international conflicts, as well as initiation of new ones.”

Article IV (“Ensuring National Security”) characterizes terrorism more specifically as one of the main threats to security. According

to Point 37, “the activity of terrorist organizations, groups and individuals directed at ...disrupting the normal functioning of state bodies ...destroying military or industrial sites, enterprises and institutions that provide for vital social activities, intimidating the population – including by means of nuclear and chemical weapons or dangerous radioactive, chemical, and biological substances” are characterized as one of the main sources of “threats to national security.”

The Strategy contains a list of measures for combating terrorism, which may be characterized as being either for domestic or for international application. The domestic measures relate to operations by law enforcement agencies, improvements to existing legislation, and implementation of administrative and technical measures required to ensure the security of hazardous materials and facilities. Specifically, national security requires “constant improvements to law enforcement measures to detect, prevent, suppress, and uncover acts of terrorism (Point 36).” “Improvement of the normative legal regulation of the combat against and prevention of ...terrorism and extremism” (Point 38) is called one of the most important goals of government security policy, while Point 40 provides for “a more secure operational regime for enterprises, organizations and institutions comprising the country’s military-industrial, nuclear, chemical, and nuclear energy complexes.”

With regard to the international aspect, the Strategy acknowledges the need for international cooperation in combating terror, saying that the vulnerability of all members of the international community has increased in the face of these new challenges and threats (Point 8). The international factor is also considered in planning operations to combat terrorism at the national level; for example, “a system is being developed to discover and counter the global challenges and crises of the modern world, including international and national terrorism” (Point 40).

The document particularly emphasizes the role of U.S.-Russian cooperation, naming the enhancement of anti-terrorist cooperation as one of the priorities for future bilateral relations (Point 18).

In contrast to the U.S. 2010 Nuclear Posture Review, the Russian National Security Strategy does not associate the war on terrorism with the problems of nuclear nonproliferation and disarmament. Point 10, however, mentions the threat of weapons of mass destruction proliferation and of WMDs falling into the hands of terrorists in a single context. In addition, one provision in the Strategy (Point

90) speaks in favor of a gradual shift toward a world free of nuclear weapons, and significant attention is devoted (in particular in Point 94) to reinforcing the nuclear nonproliferation and disarmament regimes in the world.

The Foreign Policy Concept of the Russian Federation, approved almost a year earlier than the National Security Strategy, reflects the international aspects of anti-terrorist activities more completely. In Article II, "The Modern World and the Foreign Policy of the Russian Federation," for example, international terrorism is mentioned as the main new global challenge and threat, which can be overcome **only through the combined efforts of the entire international community.**

Article III, "Priorities of the Russian Federation in Resolving Global Problems," **mentions the struggle against international terrorism** as "one of the most important national and foreign policy tasks," **requiring diverse means, such as the "systemic and comprehensive use of political, legal, information-based, propaganda, social, economic and other special measures, with an emphasis on the preventive side of these countermeasures."**

In order to bring such countermeasures to bear, **the collective efforts of all nations and regional organizations within the framework of the United Nations will be needed.** Such efforts must be based upon an international legal foundation of "universal antiterrorist conventions and UN Security Council decisions." At the same time, "Russia will use all means necessary to repel or prevent terrorist attacks against it and its citizens."

According to the document, **an adequate legal foundation for countering international terrorism was established by Article 51 of the UN Charter, which provides for the right of national self-defense. The implication is essentially that the international legal foundation for combating terrorism through the use of force needs no enhancement.**

As far as relations with countries of the Asia-Pacific Region are concerned, the document's suggestions are limited to **"regional cooperation."** The "export of terrorism" from Afghanistan should be counteracted "in cooperation with the other interested countries, the United Nations, the Collective Security Treaty Organization (CSTO), the Shanghai Cooperation Organization (SCO), and other multilateral institutions." At the same time, there is no mention of NATO, which is conducting an Afghan peacekeeping mission under UN Security Council mandate and with Russian support.

The sections of the document that deal with the countries of the Middle East and Africa (**the primary acknowledged geographic sources of international terrorism**) make no mention of anti-terrorist cooperation at all.

It can be assumed that these sections of the Concept reflect the views of those members of the **Russian foreign policy establishment** who view the war on terrorism as a useful instrument for developing relations with countries of the **West and with their security agencies**. Simultaneously, it is also seen as a useful platform for consolidating Russia's influence in the post-Soviet space, including through such organizations as the CIS, the CSTO, and SCO. Dialogue with other states, above all with the most influential Asia-Pacific Region countries, is needed only to the extent that it aids in the resolution of practical problems (**such as developing the military and political components of the SCO and preventing instability from being imported from Afghanistan**).

The 2010 Military Doctrine of the Russian Federation of February 5, 2010, contains the fewest mentions of terrorism among the three documents. Of the main "external military dangers" listed in Point 8, "the spread of international terrorism" ranks tenth (Subpoint 8(j)). Third on the list of the "main military threats" (Point 10) is "the creation and training of illegal armed groups and their activities on the territory of the Russian Federation or the territories of its allies" (Subpoint 10 (c)).

To a certain extent, this Point also refers to terrorist activity. Large terrorist groups, **such as the ones that organized the Budyonnovsk attack or the seizure of hostages at the Dubrovka Theater in Moscow**, could very well fall under the category of "illegal armed groups." At the same time, as shown above, nuclear terrorism does not necessarily involve the participation of large, well-armed terrorist groups.

This definition of international terrorism as a military danger but not a threat is also reflected by its ranking among the "main tasks" facing the Armed Forces of the Russian Federation. Thus, "**participation in the struggle against international terrorism**" is defined as one of the "main tasks in deterring and preventing military conflicts" (Subpoint 19(l)). In other words, what is dangerous is not an act of international terrorism in itself, but the risk that this act might provoke a traditional military conflict. This view ignores the fact that a nuclear terrorist attack could cause much more devastation and casualties than a military conflict of a limited scale. Such an act

carried out in a nation's capital would have immeasurably more severe consequences for the functioning of **governmental institutions** and for regional and global security than any localized conflict somewhere on the periphery.

The combat against terrorism is also listed in the document as one of the “main tasks of the Armed Forces and other troops in peacetime” (Point 27(n)), but the Armed Forces do not face this task during times of war. Once again, this raises some serious questions. As a rule, during peacetime, the Armed Forces take a more limited part in practical activities to ensure national security than during periods of threat, not to mention during wartime. However, the risk of a **major terrorist attack occurring during wartime might** actually be higher than in times of peace. For example, after having run up against the military might of a major power, a weaker nation might be quite interested in issuing an asymmetric response in order to save itself, **for which a major act of terrorism (especially nuclear)** staged in the capital of its powerful opponent could be seen as useful. Therefore the Armed Forces, considering their **enhanced authority** during wartime, should in fact have a higher responsibility for preventing such a scenario from occurring.

Unlike the other two documents, the Doctrine makes no mention of the need to engage in international cooperation in combating terrorism, an omission, incidentally, that contradicts the Foreign Policy Concept provision concerning cooperation with such political and military organizations as the CSTO and NATO.

At the same time, the Military Doctrine notes the need “to comprehensively equip (reequip) the ...antiterrorist formations with modern weapons and military and specialized equipment ...and to maintain them in a condition that will ensure the ability for their use in combat” (Point 41 (a)).

The Prospects For Cooperation

A comparison of the doctrinal documents of Moscow and Washington shows that, while the prevention of nuclear terrorism has been made a priority by the Obama administration, it has not been emphasized in the Russian documents. At the same time, the Russian concepts do contain provisions that echo the nuclear policy ideas of the Nuclear Posture Review, such as **the statement that acquisition of WMDs (in-**

cluding nuclear weapons) by international terrorists represents one of the main threats to national security. Countering this threat would require active involvement by the law enforcement authorities of the country, improvement of current legislation, and implementation of technical measures to secure the safety of hazardous materials and facilities. Both the National Security Strategy and the Foreign Policy Concept of the Russian Federation contain provisions addressing the need for international cooperation in this field, primarily with the United States.

Moreover, Moscow views its cooperation with Washington against terrorism as a strategic objective that should not be subject to the periodic fluctuations in U.S.-Russian relations. The National Security Strategy of the Russian Federation to 2020 was drafted during **the period of severe decline in U.S.-Russian relations that followed the August 2008 South Ossetian conflict**. Still, it was the one document in which **the priority of counteracting international terrorism** (including in cooperation with the United States) was most clearly reflected. Tellingly, the U.S. Nuclear Posture Review devoted much less attention to relations with Russia in this area.

From the standpoint of **the future of U.S.-Russian cooperation** in the war on nuclear terrorism, the latest doctrines published in Moscow and Washington are very promising; still, in some of the Russian documents, **particularly the Foreign Policy Concept, the international legal documents and initiatives of the 2000s that Russia had either initiated or actively pursued**, such as the International Convention for the Suppression of Acts of Nuclear Terrorism, the Global Initiative to Combat Nuclear Terrorism, the Proliferation Security Initiative (PSI), the Global Threat Reduction Initiative, the G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, UN Security Council Resolutions 1540 and 1887, etc., are not even mentioned.

Russia has accomplished quite a bit for nuclear disarmament and nonproliferation since the end of the Cold War. **Despite tough economic times**, Russia has eliminated **several tens of thousands of nuclear warheads** and destroyed or converted hundreds of nuclear weapon **delivery vehicles**. It has **undertaken colossal efforts to ensure the physical security of, and accountability and control over, its stockpiles of nuclear warhead materials**. The chaos of the 1990s notwithstanding, it never lost a single warhead or any significant amount of nuclear material to theft.

At the same time, Russia has also been one of the main victims of international terrorism: thousands of its citizens have died at the hands of terrorists. This demands that terrorism (including nuclear terrorism) **be treated with all due seriousness, no matter how remote** such a threat may appear.

In this regard, by giving the efforts to combat nuclear terrorism priority, **Russian influence in the area of nuclear arms (and disarmament issues)** could be combined with the experience the country has gained in countering and preventing terrorism.

NOTES

- 1 The United States has accused North Korea of counterfeiting dollars and in 2005 imposed sanctions on it.
- 2 U.S. Department of Defense, *Nuclear Posture Review Report*, April 2010.
- 3 Editors' note: In 2006, The International Framework for Nuclear Energy Cooperation (IFNEC) was based upon the Global Nuclear Energy Partnership (GNEP). IFNEC is a partnership of countries aiming to ensure that new nuclear initiatives meet the highest standards of safety, security, and nonproliferation. IFNEC has added the following countries to the previous GNEP as full members: Argentina, Germany, Kenya, Kuwait, the Netherlands, and the United Arab Emirates. Its three permanent international non-government observers are Euratom, the Generation IV International Forum, and the International Atomic Energy Agency.

Part III
**Reductions of Nuclear
Weapons**

CHAPTER 9

STRATEGIC OFFENSIVE AND DEFENSIVE ARMS

Vladimir Dvorkin

As has been the case for the past three decades, the U.S.-Russian strategic dialogue remains focused primarily on bilateral strategic arms reduction talks, despite individual measures in a number of other areas that were outlined at the July 2009 summit between the presidents of the two countries. For now, the success that the signing of the New START Treaty by the United States and Russian presidents represented should be seen as only a first step toward further nuclear arms reduction. Considering the alternating successes and failures of the history of the U.S.-Russian/Soviet strategic dialogue and the unpredictable military and political environment, there are clearly no guarantees of success in future talks on strategic arms or the consultations on TNW and BMD.

During the 8 years of the George W. Bush administration, U.S.-Russian strategic dialogue was placed on the back burner of U.S. policy. The United States saw no real need for the foreseeable future to even discuss further strategic arms reductions based on new agreements with Russia (following expiration of the 2002 Moscow Treaty on Strategic Offensive Reductions), and withdrew from the 1972 ABM Treaty, effectively undermining the entire nuclear arms limitation and reduction regime.

There were some minor changes in policy in 2008 due to increasing criticism not only from the Democratic opposition but from some Republicans as well, who considered it important to resume strategic arms reduction talks with Russia in light of the impending expiration of the START-I Treaty and thought it necessary to work with Russia on the Iranian and North Korean nuclear issues and the very difficult U.S. military position in Afghanistan. As a result, the State Department sent the Russian Foreign Ministry a document under the heading “Treaty between the Russian Federation and the United States of America on Transparency-

and Confidence-Building Measures in the Reduction of Strategic Offensive Arms.”

As can be seen from the first two points of Article 1, this draft of a new agreement presented no obvious further reduction of strategic arms over the 2002 Moscow Treaty, which it proposed extending by another 10 years:

- The total number of operationally deployed strategic nuclear warheads shall not exceed 1700-2200 for each side by December 31, 2012, and for a period of 10 years following the Treaty’s entry into force.
- The two sides intend to cut the numbers of strategic nuclear warheads to the lowest levels possible to satisfy the demands of national security and commitments to allies.

The remaining eight articles in the draft agreement consisted mostly of proposals on verification systems and confidence-building measures that were only limited versions of what had been in the START-I Treaty, and included a detailed description of the conditions governing visits by inspection groups carrying out verification.

The 65-page “Protocol on Transparency- and Confidence-Building Measures in Relation to the Treaty between the Russian Federation and the United States of America on the Reduction of Strategic Arms” was presented as an integral part of this agreement. This document contained procedures for exchanging data, performing on-site inspection, and submitting weapons for inspection, as well as approximately 25 different types of notification on the state of components of the nuclear triad and procedures for exchanging telemetric information, with detailed description of the content, terms, and definitions, and other verification requirements. In essence, all of these provisions echoed many of the provisions of the corresponding sections of the START-I Treaty. Moreover, the larger part of the Protocol described procedures for exchanging telemetric data on missile launches, the need for which caused serious doubt.

Thus, the set of documents presented by the U.S. side could be seen as a belated and rather awkward attempt to demonstrate the outgoing administration’s positive views on the problems of nuclear disarmament and nuclear nonproliferation in the world.

At this time, along with the anticipated signing of the new strategic arms reduction treaty by the end of 2009, U.S. and Russian experts were also considering the possibility of extending the START-I Treaty. Official circles and experts in both countries regarded this

option quite negatively, since it would significantly curtail future strategic arms programs. START-I prevented Russia from continuing the flight testing of its *Topol-M* MIRVed ICBMs (unless it changed the design to give the missile new type parameters) or increasing the number of warheads on its *Sineva* SLBMs if needed. Under the START-I rules for counting warheads and missiles and destroying weaponry, in order to comply with the requirements of the Moscow SORT the United States was to dismantle the Trident 2 SLBM launchers on at least 4 Ohio class submarines, which were then supposed to be refitted with cruise missiles. In addition, both countries saw the continuation of the inspection process as very burdensome and inappropriate for the new world situation. Thus, although START-I was recognized for its overall positive contribution to nuclear arms reductions, its provisions were criticized as unacceptably out-of-date under current conditions.

In light of the contrasting opinions on START-I, an analysis of how this unique document had been developed and applied would appear to be useful and pertinent, since many of its provisions were in one form or another used during the negotiations process and were incorporated into the new agreement, which has also provoked mixed reactions within the expert community.

START-I: Analysis of Its History

It is well known that START-I was the first arms treaty not only to limit but actually to reduce by half the numbers of strategic nuclear weapons of the two superpowers (unless the very important INF Treaty between the Soviet Union and the United States is counted, which eliminated an entire class of weapons, yet not strategic forces under the accepted classification).

First, the military and political climate that surrounded the START-I negotiations needs to be recalled. These negotiations, which had begun during a dramatic increase in tensions between the United States and the Soviet Union sparked by President Ronald Reagan's announcement of the Strategic Defense Initiative (SDI) program on March 23, 1983, continued for about seven years, until mid-1991.

During this period, there was a real danger of an unprecedented increase in the military stand-off between the nuclear superpow-

ers; of space militarization through placement of various weapon types into orbit (including those based on new physical principles); of withdrawal of the two countries from the 1972 ABM Treaty (a cornerstone of the arms control system); and of an overall collapse of the arms control system in general.

The Soviet Union launched a large number of costly research programs to develop symmetrical and asymmetrical countermeasures against the SDI: the symmetrical responses included development of a multipurpose strike orbital system and a multi-layered missile defense; the asymmetrical approaches focused mainly on the land-based ICBM group having greater power reserves than SLBMs in order to penetrate all of the layers of U.S. missile defense. Development of several new types of ICBMs began, with plans to increase the number of ICBMs from 1,398 to almost 1,700, including deployment of over 1,000 mobile launchers carrying *Topol* ICBMs and small *Kurier* ICBMs in order to significantly increase the survivability and efficiency of the nuclear deterrent.

Such were the conditions during preparations for the START-I talks. Although subsequently tensions between the two superpowers gradually began to dissipate (especially after the two presidents met in Reykjavik in 1986), there nevertheless remained a considerable amount of mistrust between the two sides, as was fully reflected in the final version of the treaty.

The over 500-page Treaty consists of 19 articles; 38 agreed statements; seven protocols; numerous associated documents (such as letters and other correspondence); 47 Joint Compliance and Inspection Commission (JCIC) agreements; 36 joint statements; 19 'S' series joint statements; a definitions annex; and annexes to the Inspection Protocol and MOU. One of the protocols related to the disintegration of the Soviet Union and consequent emergence of new parties to the treaty (Belarus, Kazakhstan, and Ukraine) was signed in May 1992. The Framework Agreement, defining continued talks on strategic arms reductions and setting out the parties' agreement to reduce their strategic arsenals to 3,000-3,500 warheads, was signed in June 1992 and also became an integral part of the START-I Treaty.

We shall list here only a portion of the main START-I provisions that are periodically discussed by officials and experts.

The main conditions for strategic arms reduction and limitation are outlined in Article 2 of the Treaty. Aside from decreasing the num-

ber of strategic delivery vehicles to 1,600 and warheads to 6,000, by the end of stage three each side was to possess no more than 154 heavy ICBMs, 4,900 warheads on ICBMs and SLBMs, and 1,100 warheads on mobile ICBMs.

The next most important article established detailed rules for counting the numbers of deployed, maintained, stored, and transported warheads, missile launchers, and heavy bombers in each party's nuclear arsenal. The Memorandum of Understanding indicated the number of warheads to be counted for ICBMs or SLBMs of each existing type. For the newer ICBMs and SLBMs, the Memorandum suggested counting the maximum amount that had undergone flight-testing. Also introduced was the so-called "40 percent rule" for the exclusion of breakout potential. Under this rule the number of warheads counted as fitted on new-type ICBMs or SLBMs with MIRVs of the existing design (or new-type ICBMs and SLBMs carrying a single warhead) must come to no less than the result of dividing 40 percent of the accountable throw-weight of the ICBM or SLBM by the weight of the lightest reentry vehicle flight-tested on an ICBM or SLBM of that type.

With the same goals in mind, rules were also set for reducing the number of warheads attributed to ICBMs and SLBMs of the existing type by a total not to exceed 1,250 warheads at any given moment; the number of warheads attributed to ICBMs or SLBMs would be reduced by no more than four units compared to the number of warheads attributed at the date of the Treaty's signing. If the number of warheads attributed to specific types of ICBMs and SLBMs was reduced by more than two units, the warhead platform of each ICBM or SLBM to which the fewer warheads were attributed had to be destroyed and replaced by a new platform. The sole exception to this was the Minuteman III ICBM, the platform of which was to be destroyed and replaced with a new one no matter what the reduction in the number of warheads. This is exactly what is being done in the United States, where these missiles are being fitted with one warhead from the MX ICBM in place of the three previously attached.

The Treaty prohibited flight testing and deployment of ICBMs and SLBMs with more than 10 warheads (which was the number of warheads deployed on Soviet heavy missiles and U.S. MX ICBMs). Increasing the number of warheads over the number counted for each type of ICBM and SLBM was also banned.

The counting rules for nuclear weapons deployed on heavy bombers were conditionally approved and did not fully take into account the real numbers deployed.

For the Soviet Union, eight warheads were counted for each heavy bomber fitted with ALCMs, within the overall limit of 180. For each heavy bomber beyond the 180 limit, the amount listed was the actual number of warheads for which it was equipped (the Tu-95ms could carry from 6 to 16 air-launched cruise missiles, and the Tu-160 could carry up to 12 cruise missiles). Thus, in principle, the total number of warheads in the Russian nuclear triad could have reached a figure of over 1,300.

For each U.S. heavy bomber fitted with ALCMs, ten warheads were counted, up to 150 units. For each heavy bomber beyond 150 units, the amount listed was the actual number of warheads for which it was equipped. At the same time, each U.S. B-52H heavy bomber was capable of carrying up to 20 cruise missiles, which made it possible to exceed the warhead ceiling of 6,000 under the START-I Treaty by 1,500 warheads.

At the U.S.'s initiative, a significant portion of the Treaty's text was devoted to restrictions on Soviet heavy ICBMs, which the United States considered destabilizing. According to the Treaty, the Soviet Union was to cut the amount of these strategic systems in half. Producing, testing, and deploying new types of heavy ICBMs were prohibited, as was increasing the throw-weights of existing heavy ICBMs. No less space in the Treaty was devoted to various restrictions on road-mobile ICBMs and their launchers, which, in the end, the United States decided not to deploy.

Deployment sites for mobile land-based ICBM launchers were limited to an area of five square kilometers, with each site having no more than 10 launchers with missiles and an equal number of stationary cover installations for them. These restrictions naturally applied to the *Topol* missiles and subsequently to the *Topol-M* as well.

The combat patrol area for the mobile launch vehicles of each base was not to exceed 125,000 square kilometers, which is considerably more than needed to provide the required stealth and survivability of the nine individual launchers per regiment.

For every seven railway stations there were to be no more than 35 permanent posts for trains carrying combat rail-launched missile complexes. Realistically, the Soviet Union and Russia have had 12 rail-based units (regiments) with three RT-23 UTTKh ICBMs in each unit.

Limits were also set for non-deployed mobile missiles, though these restrictions were quite broad in their range. Non-deployed mobile ICBMs, for example, were restricted to 250, while rail-launched missiles were limited to no more than 125, which, it subsequently turned out, was considerably more than the realistic number of Russia's ICBMs deployed on rail-based launchers (36).

Training exercises that involved moving ground- and rail-launched missile complexes out for deployment were to be contingent upon advance notice of the beginning and end of the training exercise.

Large-scale strategic training exercises involving the use of heavy bombers were to be subject to a similar requirement. They were to be conducted once a year and to have a duration of up to 30 days.

One of the most important aspects of the START-I Treaty was that it established unprecedented transparency concerning the current state and characteristics of U.S. and Russian strategic nuclear forces.

Special articles in the Treaty include provisions on a system for verifying compliance with Treaty limits, conducting inspections, and confidence-building measures, including information exchange, presentation of strategic nuclear weapons, demonstration of eliminated strategic nuclear weapons, and submission of strategic nuclear weapons for inspection on demand.

The verification system defined 16 types of inspection, including inspections relating to baseline data, new facilities, suspect sites, reentry vehicles of deployed ICBMs and SLBMs, site conversion, demonstration of systems, etc.

Confidence-building measures comprised ten groups that contained 152 forms of notification. The information exchange system between Russia and the United States stipulated in START-I included the following:

- periodic (semi-annual) data exchange on strategic offensive arms and related objectives for all categories contained in the Memorandum on the Fixation of Raw Data in Connection with START-I;
- the broadcasting of all telemetric information obtained during missile launches and the provision of tapes containing this information and all associated data analyses, as per the Protocol on Telemetric Information Relating to START-I;

- the extension of all notifications containing current information on strategic offensive arms and related objectives and all notifications in connection with the START-I Treaty.

Both sides arranged demonstrations to confirm the technical characteristics of each type of ICBM or SLBM, of mobile ICBM launchers of all types, of all types and modifications of heavy bombers and former heavy bombers, and of all types of air-launched cruise missiles.

The information exchanged under the memorandum included numerical data on the strategic nuclear weapons and indicated their deployment locations, technical data on strategic nuclear weapons, planned deployment locations, and service facilities; it also included photographs of the missiles, launchers, transporters, heavy bombers, and submarines.

When a country performed missile flight tests, it would submit to the other side after each launch the magnetic tape with all telemetric information transmitted during the flight test, all encapsulated telemetric data, and a brief description of the contents of each tape. Furthermore, the country carrying out the flight tests would give data to the other side after each launch for analysis (description of the format and encoding of the telemetry frame with regard to all telemetric information transmitted).

The Agreed Statements section of the Treaty consisted of 39 items and contained provisions on various topics and of varying levels of importance that not only clarify and explain a number of the articles in the main body of the Treaty, but also introduce additional requirements and limitations. Some of the more important of these statements are examined below.

The Seventh Agreed Statement on the permissibility of operational dispersal of mobile ICBMs contained the agreement of the two sides to conduct such dispersals only for reasons of national security during times of crisis, when one of them felt compelled to take measures in order to ensure the survivability of its strategic nuclear forces. The parties agreed that, although there were no restrictions placed on the number and frequency of such dispersals, in practice they were to occur rarely.

Under the Nineteenth Agreed Statement, if either party was to decide to develop mobile space launch facilities, then the matter was to be reviewed by the Joint Compliance and Inspection Commission and would be allowed under the following conditions:

- mobile space launchers and their associated boosters were to have differences from ICBM launchers and SLBM launchers and from ICBMs and SLBMs, respectively, and these differences were to be observable by national technical means of verification;
- mobile space launchers were not to contain any ICBMs or SLBMs;
- the number of mobile space launchers and their associated boosters that were produced and stored was not to exceed space launch requirements; and
- mobile space launchers and their associated boosters were not to be located at an ICBM base for rail-mobile launchers of ICBMs or an ICBM base for road-mobile launchers of ICBMs.

From the time the Treaty was signed and to the present day, Russia has always complied with this provision when launching its spacecraft.

Under the Twenty-second Agreed Statement, a connection was established between the INF Treaty and activities under START-I related to the continuous monitoring of the mobile missiles production facilities. In particular, when continuous monitoring was conducted at the Votkinsk Machine Building Plant simultaneously under the INF Treaty, the parties agreed to provide for the use of continuous monitoring procedures under both Treaties. No topographical engineering training (which was called for under the START-I Treaty) was to be conducted at the Votkinsk facility. In those cases where the continuous monitoring procedures required under the two treaties were identical, such procedures needed to be performed only once, with the results duly recorded in the continuous monitoring report and the inspection report.

The Statement contained provisions defining the type and use of monitoring equipment and stipulating that monitoring under the START-I Treaty and the INF Treaty was to be conducted at different times.

Important and notable for Soviet and Russian ICBMs throughout the time that START-I applied were Agreed Statements 25 and 34, which defined variants for existing and new types of ICBMs and SLBMs.

Under the Twenty-fifth Agreed Statement, an ICBM or SLBM that differed in dimension from other ICBMs or SLBMs of the same

type by over three percent but by less than the criteria for the corresponding new type would be considered to be a variant, as would an ICBM or SLBM that differed in dimension from other ICBMs or SLBMs of the same type by less than three percent. A particular feature of the Statement was that it established that the variants of the ICBMs and SLBMs would be subject to all of the same restrictions on increasing numbers of warheads and throw-weight.

In order for an ICBM or SLBM to be considered a missile of a new type, it had to have a throw-weight that exceeded the accountable throw-weight of an existing or previously declared new type of ICBM or SLBM by 21 percent or more. The length of the first stage of an ICBM or SLBM of a type declared to be a new type would be considered changed if it differed from that of an ICBM or SLBM of the same existing type or previously declared new type by five percent or more.

The throw-weight of a new type of ICBM or SLBM was the greatest throw-weight demonstrated in flight tests over a range of no less than 11,000 km for an ICBM or 9,500 km for an SLBM.

If an ICBM was declared to be of a new type relative to the *Topol* (SS-25) ICBM on the basis of an increase of 21 percent or more in throw-weight in conjunction with a change of five percent or more in the length of the first stage, then its throw-weight was taken to be the greatest throw-weight demonstrated in flight tests over a distance of no less than 11,000 kilometers.

This placed serious limits on modernization, in particular the modernization of the *Topol* missile, which continued to have considerable residual power potential. U.S. specialists were quite aware of this fact and strove to impede any improvement to the combat effectiveness of the missile. However, it would be impossible to place more than one warhead at a time on the *Topol* missile unless it was transformed into a new type of ICBM (which was also true of SLBMs). In order to reclassify the missile as a new type, however, design changes and new flight tests would be required, which would involve great expenditures of time and money.

Modern readers might interpret the final version of the START-I Treaty documents in differing and contrasting ways, unless they take the process of searching for compromise in the majority of the most important provisions into consideration. Even the experts who took part in the negotiations or helped to formulate positions at the various stages of the negotiating process frequently discover that the pre-

vious arguments contradict current assessments of the Treaty due to the radically different conditions existing then and now. For example, the Soviet Union's agreement to eliminate half of its SS-18 heavy missiles was secured with great difficulty at the time, but since the fall of the Soviet Union and the changes that have come to pass in the political and military situation as a whole, not only does this decision appear to be well justified, but also inevitable, and not only because the missiles were manufactured in Ukraine, but also because within the strategic nuclear forces, the predominance of stationary ICBMs with a great number of warheads on each missile became a serious destabilizing factor.

It should be remembered that during the early stages of negotiations, virtually every page of the text was thickly covered with parentheses surrounding the U.S. and Soviet versions of text that had not yet been agreed to. A number of disagreements were overcome only during the final stages of negotiations.

For a long time, for example, the United States had been attempting to impose a general ban on the deployment of mobile land-based ICBMs. The Soviet Union felt the most pressing need for having such missile systems to ensure the survivability of its ground forces, since in the mid-1980s the United States had begun to deploy precision-guided MX ICBMs and SLBMs fitted with more powerful and accurate warheads. The warheads of these missiles would be highly effective against Soviet hardened-silo launchers, which substantially reduced the counterstrike capability, while the Soviet Union's naval strategic nuclear forces were unable to fully compensate for this due to its small ratio of strategic submarines on patrol. The United States had projects to develop mobile ICBM systems (MX and Midgetman), but later dropped them, chiefly because it already had a highly effective naval component able to provide a counterstrike of the necessary power.

In this regard, it is worth recalling an interesting and rather candid opinion expressed by members of the U.S. military and recorded in what at the time was a confidential regular report by the head of the Soviet delegation on the results of unofficial discussions with his American counterpart at the negotiations in Geneva. From the answer to the question as to why the United States would not agree to allow deployment of mobile land-based missiles, it was implied that the diplomats had no objection to this type of missile, but the military was firmly opposed because they

would make it harder for military officials to plan nuclear strikes against Soviet strategic nuclear forces (!). At the time, this candid response had been perceived as evidence that the United States was intent on planning a disarming strike against the Soviet Union, and this only gave the Soviet Union further incentive to build up its mobile strategic nuclear forces. It could also be seen as reflecting the actual state between the political and military headquarters of the two countries, although, in reality, no matter what the position or decisions of any country's leadership, its military is required to make plans for its armed forces to use under any feasible scenarios of military action.

Fairly rapid agreement was reached on banning the development and deployment of air-launched ballistic missiles, because the two sides had carried out enough research and experiments in this area to give them the experience they needed. Since results showed that air-launched missiles performed far worse than land- or sea-launched missiles in terms of combat effectiveness, operation and maintenance, and overall cost, the two sides readily agreed to renounce them. Recently, however, some experts, unaware of this whole background, have once again begun proposing that new air-launched missile systems be developed, mistakenly thinking that these new technologies would be capable of changing previous conclusions.

Strong critics of START-I have emerged in Russia over recent years, including within the upper echelons of government, who consider the Treaty criminal and treasonous, thus displaying a shocking ignorance of (or stubborn insistence on closing their eyes to) the circumstances that prevailed at the time it was drafted and signed. Some military experts have criticized START-I for the restrictions it set on the mobility of land-based missiles, for the detailed monitoring that it allowed U.S. inspection teams to conduct at Russian nuclear forces sites, for the continuous monitoring at Votkinsk, and for a number of other limitations that it set.

In the first place, however, no real restrictions were ever set (and still do not exist) on the patrol times and routes of land-based road-mobile missiles, inasmuch as from the start the patrol area had been excessively large, and during crisis situations that threaten imminent war, such restrictions would become meaningless anyway. Under these conditions, what is important is not the land area, but the layout of the road network over which the missiles can travel, and on this particular point the Treaty set no restrictions whatsoever.

Second, although the START-I verification system had indeed been very unwieldy and excessive, especially when considered from the current perspective, it must be remembered that this system was developed during the Cold War period, in the immediate aftermath of a flare-up in tensions between the Soviet Union and the United States, and at that time the two sides had been deeply mistrustful of each other. The greater intensity of U.S. inspection activity was due only to the requirement that the country carrying out the inspections had to pay the costs of the inspections, while the Votkinsk factory was subject to continuous monitoring because it had been identified as the production facility for components of mobile ICBMs, which the United States had abandoned.

On the whole it must be understood that the United States was negotiating with the Soviet Union, which was every bit the equal of its partner in the strategic dialogue in terms of military might and influence on world events. Thus, the concessions made by both sides were essentially equal. As for the decision-making process during the negotiations, it must be remembered that the process of drafting and approving each article, memorandum, protocol, agreed statement, etc., in START-I took several years. In the Soviet Union, positions on all disputed issues were compiled by the now legendary “group of five,” consisting of top professionals from the Military-Industrial Commission of the USSR Council of Ministers, the Ministry of Defense, Foreign Ministry, KGB, and the Central Committee of the Communist Party of the Soviet Union in an environment of intense debate and compromise. The idea of allowing any unequal concessions was totally out of the question.

As an integrated answer to all of the criticisms that have been leveled against the START-I Treaty, it can be said that (within the context of the time at which it was signed) the reductions that the Soviet Union made in its strategic nuclear forces under the Treaty not only maintained its nuclear deterrent (i.e., the effectiveness of its counterstrike potential), but actually increased its deterrent potential because of the diminished power of a U.S. disarming strike.

After the disintegration of the Soviet Union, the positive aspects of START-I became even more obvious, which may be understood by recalling the condition of Russian strategic nuclear forces by that time.

In 1992, the nuclear triad that Russia had inherited from the former Soviet Union had a total of 10,299 warheads, including 6,642

warheads with the ground forces, 2,804 with the naval component, and 853 warheads with the aviation arm.

Russia's strategic nuclear forces had in service 308 silo-based SS-18 heavy ICBMs with 10 warheads each, 300 SS-19 Mod 3 ICBMs with 6 warheads each, 56 SS-24 Mod 2 ICBMs with 10 warheads each, and 36 SS-24 Mod 1 ICBMs on mobile rail-based launchers, 288 single-warhead *Topol* ICBMs on road-mobile launchers, and 366 single-warhead SS-11 and SS-13 Mod 2 silo-launched ICBMs.

The strategic naval component had 940 SLBMs deployed on 62 strategic submarines of 8 different classes. Five types of SLBMs (SS-N-6 Mod 1, SS-N-6 Mod 2, SS-N-8 Mod 1, SS-N-8 Mod 2, and SS-N-17) had single warheads, and three types of SLBMs (SS-N-18, SS-N-20, and SS-N-23) were equipped with MIRV warheads. The strategic air force consisted of 15 Tu-160 (Blackjack) heavy bombers, 84 Tu-95ms (Bear H) heavy bombers and 61 Tu 95k (Bear G) bombers carrying air bombs.

The features of the strategic nuclear forces that Russia inherited from the Soviet Union included the following: first, a large portion of these weapons had already been in service for lengthy periods. Deployment of the SS-11 and SS-14 ICBMs had begun in 1971-1972, deployment of the SS-17 and SS-19 MIRVed ICBMs had begun in 1977-1978, and deployment of heavy ICBMs had begun in 1978. The class 667 missile submarines with single-warhead SLBMs had begun entering service in 1968-1974. Second, the excessive number of different types of missiles in the land and sea strategic components (8 types in each) incurred significant redundant operational costs.

One of the most dramatic periods was connected with the elimination and transfer to Russia of a portion of the strategic arms located within the borders of the new countries of the CIS. By the time of the disintegration of the Soviet Union, there were 176 silo-based ICBMs in Ukraine, including 130 SS-17 ICBMs and 46 SS-24 ICBMs, 13 Tu-160 heavy bombers, and 21 Tu-95ms heavy bombers. In Kazakhstan, there were 104 silo-based heavy ICBMs and 40 Tu-95ms heavy bombers, and in Belarus there were 54 *Topol* missile launchers.

The disintegration of the Soviet Union interrupted the process of ICBM modernization and the development of new ICBMs that were to have been dramatically more effective in penetrating the anticipated U.S. missile defense. The replacement of the third SS-18

model with its modernized variant remained incomplete. Work relating to the repair of existing strategic submarines and the construction of new ones was significantly delayed, as were projects to improve SLBMs and modernize heavy bombers and air-launched cruise missiles.

Russian strategic nuclear forces thus began to be reduced naturally, not influenced by the START-I Treaty (by the time of its entry into force in December 1994, the number of warheads in the Russian nuclear triad had already dropped from 10,299 in 2002, to 7,059; in particular, the number of heavy missiles had decreased from 308 to 204 and the number of strategic missile submarines had declined from 62 to 47).

Meanwhile, the U.S. strategic forces remained essentially unchanged in composition but still subject to reduction under the terms of START-I. Thus, the Treaty enabled Russia to maintain a strategic nuclear balance with the United States, even at what was a very critical time for Russian strategic forces and its military-industrial complex.

One of the lessons of the START-I Treaty that continues to be relevant today is that the new Treaty and the others that could follow it in the foreseeable future will allow Russia to maintain a nuclear balance with the United States as the last remaining attribute of its superpower status, notwithstanding the many-fold predominance of funds available to the United States for maintaining and developing its nuclear forces. The START-I Treaty itself will long remain an encyclopedia of knowledge and experience that has already been put to full use in drafting the New START Treaty, and will prove to be useful in the future as well. The drafters of the START-I Treaty (some of whom, unfortunately, have since passed away) have every reason to be proud of work well done.

The New START Treaty and Prospects For Further Reductions

The Joint Understanding on the Further Reduction and Limitation of Strategic Offensive Arms signed in July 2009 at the Moscow summit attested both to a certain amount of progress in the resumed strategic dialogue between the United States and Russia and to the substantial problems that still needed to be resolved. These problems

concerned not only the existing differences between the two countries on missile defense issues, the installation of precision-guided warheads on strategic delivery vehicles, and the fact that U.S. strategic forces would retain an upload potential even after implementing the provisions of the new treaty. There are groups in the United States and Russia that consider close strategic dialogue to be not in the interests of national security, as evidenced by the stormy protests that broke out in the United States after President Obama announced his decision to cut missile defense spending by 14 percent and reaffirmed the decision not to continue the RRW new warhead research and development program, and the like. In Russia, meanwhile, some hold the view that the United States is trying to draw Russian strategic nuclear forces into the disarmament process in order to gain absolute military superiority through the multifold superiority in its conventional forces. Such discord has led to an initially large disparity between the U.S. and Russian negotiating positions on desired limits for strategic carriers (respectively 500 and 1,100) and warheads (respectively 1,500 and 1,675).

By expending significant efforts, the two sides managed to overcome these obstacles and sign the New START Treaty (the full title of which was, "The Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms").

The parameters and conditions of the Treaty signed by the presidents of Russia and the United States in Prague on April 8, 2010, have been discussed quite broadly throughout the expert community, and discussion will continue at least throughout the duration of the Treaty.

Unlike its predecessor, the new Treaty contains as its main restrictions (Article II) only maximum permissible numbers of warheads on deployed launchers (1,550) and of deployed launchers themselves (700), and aggregate numbers of deployed and non-deployed launchers for ICBMs and SLBMs and heavy bombers (800). There are no restrictions on the structure or the sublevels of the nuclear triads in the two countries. The rules for counting warheads (Article III) have changed significantly compared to those of the START-I Treaty: they are now counted by the number of warheads actually placed on the ICBMs and SLBMs, regardless of the number of places for warheads on their platforms, and any number of air-launched cruise missiles on heavy bombers is to count as a single warhead.

Submarines can now be recategorized from deployed to non-deployed by removing the hatches on the launch tubes, the associated fairing, and, if possible, the gas generators (Treaty Protocol, Part III, Section IV, Point 1); it is no longer necessary either to “pull out” the launch tubes or to cut out the missile compartments completely, as required under the preceding Treaty.

The only requirement for removing a submarine from consideration as a strategic offensive weapon is that it be demonstrated that all launchers have been converted so as to preclude SLBM launches (for example, by reconfiguring them to launch cruise missiles); the side performing the conversion may decide how best to demonstrate the reconfiguration (see Treaty Protocol, Part III, Section IV, Point 7).

The New START Treaty imposes no restrictions on offensive strategic arms modernization and replacement, other than the requirement to declare any new types of ICBMs or SLBMs that differ from earlier types in their technical specifications in one or more of the following areas: number of stages, type of propellant, length of the missile (without the reentry vehicle), length of the first stage, and change in diameter of the first stage by over 3 percent (Protocol, Part 1, Point 42). Compared to what was allowed under START-I, this gives the parties considerable freedom to modernize and change missile loads.

In addition, nearly all of the previous restrictions on spatial and temporal parameters for mobile ICBMs have now been lifted, which was something to which Russia attached great importance during the negotiations.

One problem that arose even before the negotiations began and continued throughout the negotiation process was the U.S. plan to equip SLBMs and ICBMs with precision-guided non-nuclear warheads. As can be seen from the text of the Treaty, the United States agreed to count missiles armed with such warheads as part of the overall total of allowed strategic arms. This would mean that the United States has no plans to deploy non-nuclear SLBMs and ICBMs in any numbers that would tangibly reduce the capability of its strategic nuclear forces.

At the same time, Washington would not accept any restrictions or inclusion methods for strategic submarines reconfigured to carry conventional cruise missiles or for heavy bombers (the B-1s or an additional number of B-52 bombers) refitted with non-nuclear air-launched cruise missiles.

The two sides made considerable changes to the inspection and notification system that they had agreed to. The frequency of inspection was reduced from 28 to 18 per year and split into two types: the first includes inspections to confirm data on the numbers and types of deployed and non-deployed arms, the numbers of warheads on deployed ICBMs and SLBMs, and the number of weapons on deployed heavy bombers; the second covers inspections to check data on the numbers, types, and technical specifications of non-deployed weapons and the reconfiguration or elimination of weapons, as well as inspections to confirm that earlier declared facilities are not being used for purposes that violate the Treaty's provisions.

Part IV of the Protocol considerably reduces the notifications required on current baseline information on the state of strategic arms, on their movements, and on inspection activities. There are now 42 types of notification instead of the 152 types under the START-I Treaty.

Lengthy discussions on the need to exchange telemetric information ended with the two parties agreeing to make the magnetic tape with the recorded flight parameter information available for no more than five missile launches every year, with the side itself selecting the specific launches for which it will make the necessary information available. This has entirely eliminated concern from the Russian side caused by the fact that it is the only one to be carrying out flight tests of new ICBMs and SLBMs, the data on which would have had to be disclosed to the United States, while the United States has no immediate plans to develop any new ballistic missiles. However, there have been shortcomings to such a position. First, the United States has already obtained telemetric information from flight tests of new Russian ICBMs and SLBMs during the period when START-I was in effect, and subsequent launches are unlikely to add much to this information. It is possible that Russian negotiators were considering the idea that in the more distant future Russia might develop or test a new heavy missile, although it is not at all clear that Russia has any real need for such a missile. Second, the U.S. plans to flight test SLBMs and ICBMs armed with conventional precision-guided warheads and information on the technical characteristics of these missiles in this configuration could prove useful to Russian specialists.

As already mentioned, the START-I Treaty included 39 Agreed Statements; the new Treaty contains only 10 (Protocol, Part IX), mostly concerning inspection activities, arms exhibition procedures

(including the examination of SLBM launchers reconfigured for launching cruise missiles), and the traditional ban on rapid reloading (see the Fifth Agreed Statement).

The overview of the New START Treaty and Protocol presented above, naturally, does not cover many of the provisions and particulars that had been carefully worked through at the negotiations and will be of significance during the process of implementing all of the established limitations, conditions and rules; it presents only the main provisions and limitations that distinguish the New START Treaty from START-I.

Particularly worthy of note are the substantial increase in mutual trust and the reliance upon the significant experience that had been gained in monitoring and verification under START-I, which have made it possible to considerably reduce prohibitions and restrictions on strategic arms, cut back inspections, and so on.

There were also other factors that affected the content of the new Treaty. In contrast to the Cold War period, relations between Moscow and Washington now are not the most crucial aspect of international relations, but merely one of a number of important issues of international relations and of the foreign policy of the United States (to a lesser extent) and Russia (to a greater extent). Similarly, the strategic nuclear balance and nuclear arms talks are not the central international security issue, but only one of the key problems of international security (including terrorism, nonproliferation of WMDs and their delivery vehicles, local conflicts, and so on). Accordingly, the two sides have begun taking a less rigid and less picky approach to negotiating agreements on strategic offensive arms, with the parties prepared to move a number of problems and disputes down the list of priorities or leave them to be resolved in the future.

A unique aspect of the New START Treaty is that during the negotiations the United States did not pursue a goal of eliminating, cutting, or limiting particular Russian arms or programs at any cost (as it had done previously with Soviet and Russian heavy ICBMs or mobile missiles, for example), focusing instead on preserving the transparency regime to the maximum possible extent. This was a result of the U.S. expectation that cuts would be made to Russia's strategic nuclear forces regardless of any treaty obligations due to economic and technical problems and also a number of specific decisions that Moscow had made over the previous decade regarding its strategic programs.

However, since Washington had stopped pursuing the goal of restricting specific Russian arms and programs, Russia found itself with no bargaining chips it could exchange for U.S. concessions (such as counting rules, restrictions on strategic systems reconfigured for conventional arms, etc.). Furthermore, the Democratic administration had to prepare for strong Republican opposition to ratification of the Treaty. Moscow, for its part, did not find it necessary to make concessions on the verification regime (continuous monitoring in Votkinsk, ban on encoding telemetric information, etc.). Since it had its reasons, primarily political, for wanting to conclude the new Treaty (Obama's election campaign promises, his Nobel Prize, and the NPT Review Conference), the United States accepted this position. Time was also a factor: since START-I was to expire in December 2009, the schedule of negotiations had to be accelerated.

The new Treaty illuminates a most important and congruent feature of the nuclear policies pursued by both Moscow and Washington: neither of them for the foreseeable future intends to make real reductions in the numbers of strategic arms below the levels set by the 2002 Moscow Strategic Offensive Reductions Treaty (1,700-2,200 warheads). The lower number of warheads under the New START Treaty actually only reflects the fact that the rules for counting weapons on heavy bombers have changed. Taking the figure of 1,120 cruise missiles (warheads) as the realistic carrying capacity of the 56 deployed U.S. B-52 heavy bombers, for example, under the conditional counting rules established under START-I these bombers would be counted as having 672 warheads; now, this number will be reduced to 56. Similarly, the number of armaments that Russia's 77 deployed Tu-160 and Tu-95ms heavy bombers could realistically carry (over 850) will go to 77.

Moreover, there were specific concepts of a strategic operational and economic nature behind such innovations. The fact that the two sides agreed in a way to reduce the "weight" of their heavy bombers somewhat reflects their vision of the role such weapons would perform in strategic operations by the nuclear triad during an exchange of massive nuclear strikes, which during the Cold War had been considered as the main form of strategic nuclear operations. The role of heavy bombers before, during, and after massive ICBM and SLBM strikes has never been defined with any particular clarity.

Nevertheless, the following considerations should be noted with regard to future arms reductions. Over recent years, four well-known

lines of thought have developed aimed at nuclear disarmament up to the eventual final elimination of all nuclear weapons: the movement headed by Henry Kissinger, Sam Nunn, William Perry, and George Schultz; the International Luxembourg Forum on Preventing Nuclear Catastrophe; the Evans-Kawaguchi International Commission for Disarmament and Nonproliferation of Nuclear Weapons; and the international Global Zero initiative. If the Pugwash movement is also included, there are five influential international groups, each having current and former presidents, ministers, senators, religious leaders, well known public activists, and influential experts among its members. The U.S. and Russian presidents and leaders of a number of other countries have supported the idea of full nuclear disarmament as an ultimate goal.

It would be difficult to label the members of these movements idealists. The vast majority of them are fully aware that a nuclear-free world would only be possible under a system of global and regional security that fundamentally differs from the system in place currently or likely to develop in the near future. Under such a system, it should be possible to achieve a stable international consensus on the main problems that threaten to lead to armed conflict, and a greater number of conventional forces in one country would not be seen as being a threat to any other country, and so on, not to mention the fact that a definitive solution could be found to the Iranian and North Korean nuclear crises. Stage by stage progress toward this kind of world is the main objective of those calling for nuclear disarmament, with the elimination of all nuclear weapon stockpiles being the final stage in this process; it would be pointless to try now to make forecasts as to when this might actually happen.

It would be more relevant to evaluate the potential for new consultations and negotiations to further reduce the levels of strategic nuclear weapons below those of the New START Treaty, which, as has been noted, reflects obvious constraint in this regard on the part of both Moscow and Washington. A number of Russian experts believe that the New START Treaty represents the last cuts that Russia could possibly make to its strategic forces, and that any further cuts would be unacceptable, given the overwhelming superiority of the United States in conventional forces, the increasing efficiency of its missile defense systems, and other reasons. Arguments in favor of new talks to bring these countries closer to fulfilling their obligations under Article VI of the NPT do not seem convincing to them.

Thus, the most important goal over the near term for the political leadership in Russia and the United States (with the support of research institutes and the expert community) should be to overcome the old Cold War stereotypes and mutual distrust in order to transform the state of mutual nuclear deterrence.

The New Architecture of U.S. Missile Defenses: A Deferred BMD Crisis or Cooperation?

The crisis between Russia and the United States over missile defense in Europe that had been defused by President Obama's decision to adopt a new architecture for the U.S. missile defense system might very well flare up again in an even more accentuated form when the U.S. Standard 3 sea-launched anti-ballistic missiles and their land-based equivalents reach their strategic potential by 2020.

Under plans announced by Obama and the Pentagon, deployment of the GBI strategic anti-ballistic missiles in Alaska (26 BMD missiles at Fort Greely) and California (4 ABMs at Vandenberg AFB) is to be suspended. As a standby, 14 GBI missile silos are being built in California, which can be loaded with the ABMs if the need arises. It is felt that this would protect the U.S. territory from single ICBM launches; however, test launches of the GBI interceptors will continue. Plans for a missile defense system in Europe and other regions to defend against ballistic missiles launched from Iran anticipate that the deployment would involve four stages.

Stage 1, planned for 2011, involves deploying SM-3 (Block 1A) interceptors on ships based in the Mediterranean Sea with the aim of protecting Europe and allied armed forces from short-, medium-, and intermediate-range ballistic missile threats.

During stage 2 (by 2015), enhanced SM-3 (Block 1B) interceptors and additional radars will be deployed to enhance the effectiveness not only of the European missile defenses, but of the strategic interceptors in Alaska and California, as well. During this stage, the ground-based version of the sea-launched SM-3S interceptor will also be deployed in southern Europe.

For stage 3, a modernized version of the SM-3 (Block IIA) interceptors and their ground-based equivalent would be deployed in northern Europe by 2018, which will be of even greater effectiveness against intermediate-range ballistic missiles. The SM-3 anti-

ballistic missile with an increased range is being developed for this purpose, its range extended by adding to the mass of solid rocket fuel (increasing the diameter of the second and third stages by approximately 1.5 times, from 34.3 cm to 53.3 cm).

Stage 4 involves further modernization of the SM-3 (Block IIB) interceptors (capable of destroying ICBM warheads) before 2020.

Meanwhile, modernization of the combat control and guidance system will continue at all four stages. It is anticipated that the enhanced velocity characteristics of the anti-ballistic missiles will allow them to destroy Iranian intermediate-range missiles and ICBMs during the boost phase of their flight (using ship-launched Aegis missile systems deployed in the Mediterranean Sea).

The decision has been made on deploying in Europe not only the ground-based version of the SM-3 interceptor (in Romania), but also the X-band (centimeter-band) radars. Such radars could potentially be installed in Georgia, Turkey, or the countries of Eastern Europe. In any case, however, such radar would remain an integral component within a joint missile defense system covering the United States and Europe, which includes the radars in the ballistic missile early warning system, and as such the entire system would be perceived in Moscow from the point of view of the potential threat that they might pose to Russia's nuclear deterrent capacity.

In this regard, the analysis by U.S. and Russian experts of U.S. missile defense system capabilities in Europe to intercept Iranian missiles presented in joint papers published by the East-West Institute¹ is of great interest. In particular, it showed that the relatively high resolution of X-band radars (to 15 cm) allows them to detect both the warheads and some of the decoys during the extra-atmospheric portion of their flight path, but they cannot reliably distinguish between them. At the same time, even the relatively unsophisticated countermeasures available to Iranian missile specialists could reduce a warhead's effective reflective area from 0.03 cm² to 0.01 cm², which would substantially shorten the distance at which warheads can be detected. In the best case, if the number of X-band radar modules were increased to 80,000, then the distance at which the warheads would be detected would be around 1,300 km, with the minimal required distance being about 2,000 km. On the average, 5 ABMs would be needed to intercept each Iranian warhead.

There is no doubt whatsoever that Russian ICBMs and SLBMs (which have been developed over a number of decades and continu-

ally been modified and adapted to counter prospective missile defense systems) are equipped with much more effective means of overcoming missile defenses. **It is precisely for this reason that the new U.S. missile defense architecture planned for deployment will have essentially no effect on Russia's nuclear deterrence capability.**

As was noted above in Chapter 1, a threat to Russia would emerge only in the event of a massive increase in ground-, sea-, air, and space-based echelons of intercepting missiles and warheads at any portion of their flight path, which would mean a return to the nuclear stand-off and a new arms race. However, the chances that U.S.-Russian relations would degrade to such a radical degree are negligible.

At the same time, with the United States unilaterally deploying its missile defense system in Europe even under the revised architecture announced by the Obama administration, a new missile defense crisis could disrupt relations between the two countries, just as the crisis over U.S. plans to deploy missile defenses in Poland and the Czech Republic had done previously, especially once the United States and Russia have approved declarations on strategic cooperation (including in the area of missile defense) and have accepted linkage between strategic offensive and defensive weapons under the New START Treaty. The only way to prevent a crisis of this kind from expanding would be by taking reciprocal steps toward close cooperation in the area of European and global missile defense.

President Obama and the leaders of the Pentagon have repeatedly declared their willingness to cooperate with Russia on missile defense. During the U.S. president's visit to Moscow, for example, he said, "I want us to work together on a missile defense architecture that makes us all safer. But if the threat from Iran's nuclear and ballistic missile programs is eliminated, the driving force for missile defense in Europe will be eliminated. This is in our mutual interest." The Russian leaders have expressed their views on the subject more cautiously.

Decisions on missile defense cooperation taken by the leadership in Russia and the United States are so far being implemented only to evaluate and coordinate information on likely missile threats. It can be assumed that this process of coming to terms will continue for quite a long time. Russian experts will argue that the timeframe for Iran and North Korea to produce an extended range missile should be moved back, since the two countries are using old Soviet technology, while U.S. assessments will be based on information suggesting

that the two countries are in fact using more modern technology obtained from other nations.

However, the fact that such assessments have already been carried out very recently by perfectly competent U.S. and Russian specialists under a program by the East-West Institute and have provided a detailed review of the current status and potential development of North Korean and Iranian ballistic missiles and boosters does not appear likely to be considered.

Highly placed civilian and military officials in Moscow have traditionally opposed improving cooperation on missile defense out of a persistent mistrust and fear of losing sensitive technologies. However, Russia's technological lag leaves little for it to lose, while by contrast cooperation would offer opportunities to acquire new knowledge and technologies.

Meanwhile, as time goes by, the opportunities for Russia to pursue full-fledged cooperation are, at a minimum, not increasing. If Russia once was justifiably able to speak about its lead in developing high-speed interceptors using more advanced types of solid fuel, then at present this could hardly be the case, with the United States working so intensively on developing interceptors able to strike missiles during the boost stage of their flight paths.

However, considerable capabilities remain in the field of missile defense information systems. Independent U.S. experts estimate that integration of the U.S. and Russian ballistic missile early warning systems would improve missile and booster launch detection effectiveness by between 30 and 70 percent. Even closer cooperation could be achieved through deployment of a low-orbit space-based global missile defense information system, the satellites of which could be placed into orbit at the required altitude and declination using converted heavy missiles under the Russian-Ukrainian "Dnieper" project.

Under an integrated missile defense system, sites within Russia could be protected with the S-400 or the promising S-500 systems.

In order to overcome existing obstacles, it would be advisable to first restore those elements of cooperation that had been lost over previous years. Of primary importance would be to revive without delay the project to establish a Data Exchange Center covering missile and booster launches. The presidents of Russia and the United States had agreed to establish such a center 12 years ago, and the intention to do so was reaffirmed by the current presidents of the two countries during the Moscow summit of 2009. In parallel with this,

the series of computer-based joint training exercises with the United States and NATO on theater **missile defense that had been interrupted** should also resume and subsequently be expanded beyond purely theater **operations. Past experience with joint training exercises** has shown that delineating zones of responsibility should pose no particular problem.

These steps would make it possible not only to preclude a quite likely new missile defense crisis from arising in U.S.-Russian relations, but also to decisively affect the transformation of the system of mutual nuclear deterrence between the two nuclear superpowers.

Thus, the START-I Treaty between Russia/the Soviet Union and the United States has played its role in history by ensuring strategic stability during the very complicated and contradictory situation following the end of ideological and military confrontation between the two global systems. This treaty was of special significance for Russia in that it made it possible at a critical time for Russia's strategic nuclear forces and defense industry to maintain a strategic nuclear balance with the United States, notwithstanding the many-fold superiority of the latter in resources available for maintaining and developing its nuclear forces. It is also important that the START-I Treaty was put to full use in drafting the new **Treaty, and will continue** to be useful in the future as well. Any criticism of the Treaty would thus appear unfounded.

The negotiations in 2009 and 2010 and the signing of the New START Treaty between the United States and Russia have ended a protracted pause in the strategic dialogue between the two nuclear superpowers, demonstrated growing trust, and shown that the two countries are able to find compromise solutions to complicated problems.

The main limits under the New Treaty establish the number of warheads permitted on deployed launchers (1,550), the number of deployed launchers allowed (700), and the total number of deployed and non-deployed launchers for ICBMs, SLBMs, and heavy bombers (800). The Treaty has set no restrictions on the structures or sub-levels of the nuclear triads of the two sides, but has simplified the rules for counting strategic weapons and for the system of inspections and notifications.

At the same time, the new **Treaty has demonstrated a most important area** where the nuclear policies of both Moscow and Washington

coincide: neither of them in the foreseeable future intends to make real reductions in the numbers of strategic arms below the levels set by the 2002 Moscow Strategic Offensive Reductions Treaty. The reduced number of warheads under the New START Treaty is actually only a demonstration of the fact that the rules for counting armaments on strategic carriers have changed. It would appear that the missile defense issue and related problems are seen as more important than continued strategic offensive reductions.

Decisions on missile defense cooperation by the leadership in Russia and the United States are so far being implemented with insufficient energy and are only focused on evaluation and coordination of the information on likely missile threats. At the same time, the potential for Russian cooperation in deployment of regional and global missile defense systems, although declining with time, still remains considerable in the area of information systems integration. Persistent mutual mistrust and bureaucratic obstacles continue to hinder the acceleration of this cooperation.

NOTES

- 1 *Yaderny i raketny potentsial Irana: sovmešt'naya tekhnicheskaya otsenka ekspertami iz SSHA i Rossii.* (New York: East-West Institute, 2009), http://www.ewi.info/system/files/reports/RU_Iran_03.pdf.

CHAPTER 10

NON-STRATEGIC NUCLEAR WEAPONS

Alexei Arbatov

The New Strategic Arms Reduction Treaty (New START Treaty) concluded between Russia and the United States on April 8, 2010, in Prague represented a return to the use of legally binding treaties to cut the numbers of nuclear weapons, clearing the way for further disarmament measures in accordance with Article VI of the NPT.

It will become important in the context of further nuclear arms reductions and limitations to expand this process to include non-strategic (or sub-strategic) nuclear weapons. According to common definition, such weapons usually include intermediate-range nuclear weapons and operational and tactical nuclear weapons in general (conditionally generally referred to as TNWs).

During negotiations on the New START Treaty, the U.S. Senate insisted on including TNWs in the cuts; however, that did not happen. The United States expressed particular concern over Russian non-strategic nuclear weapons in its Nuclear Doctrine (as formulated in the Nuclear Posture Review – NPR) and stressed the need to include them in the agenda of future negotiations.¹ Therefore, there is every reason to expect that the United States and NATO will exert even greater pressure in this area in the future. Several specific arguments have been advanced in support of this:

- it is commonly assumed that Russia retains a large advantage over the United States and NATO in this class of nuclear weapons; and a reduction of strategic nuclear forces (SNFs) will accentuate this;
- this alleged Russian superiority is beginning to worry Washington's NATO allies;
- during wartime, TNWs would be deployed with the general purpose troops and could be suddenly become involved in combat operations, with the risk of a rapid nuclear escalation;

- it is assumed that the systems in place for preventing unsanctioned TNW use would be less reliable than those for SNFs, thus increasing the danger of an unsanctioned nuclear strike;
- it is generally recognized that forward-based TNWs (especially the older types) are less secure and more vulnerable to theft, are of smaller weight and size, and are fitted with less effective lock-outs, which makes them particularly tempting targets for terrorists.

The Russian position on this issue has remained quite taciturn and vague, amounting to a demand for withdrawal of all U.S. TNWs from Europe as a precondition for any dialogue. This topic has also remained nearly taboo within the Russian expert community and the press, and only a few publications have examined the issue.²

Nevertheless, considering the anticipated greater attention to this issue in the context of nuclear disarmament, as well as the role of TNWs in discussions on European security and Russian relations with NATO and other nations, it would appear to be an appropriate time to conduct more in-depth and systemic research on the subject.

The Topic of Discussion

Even defining a topic of discussion in any future negotiations is fraught with difficulty. Leaving aside for now the military and strategic aspects of the problem, it would appear logical for the sake of establishing the legal basis and subject of negotiations to classify the nuclear weapons not addressed under the existing START or INFs agreements as non-strategic systems.

In that case, nuclear weapon delivery vehicles would include ground-based ballistic and cruise missiles having ranges of less than 500 kilometers, combat aircraft with ranges of under 8,000 kilometers that are not equipped to carry long-range (i.e., up to 600 kilometers) air-launched cruise missiles, and submarine-launched ballistic missiles (SLBMs) having ranges of under 600 kilometers.

Moreover, based on the parallel obligations that the United States and the Soviet Union/Russia had agreed to in the early 1990s to reduce or eliminate TNWs, they include artillery systems and nuclear mines (atomic demolition munitions) operated by the ground forces; defensive anti-aircraft (AAC) missiles; and **rockets and bombs (includ-**

ing depth bombs) on Air Force and Navy non-strategic attack aircraft, as well as various tactical surface-to-air, anti-ship, and anti-submarine missiles and torpedoes on ships and multi-purpose submarines.

Even this broad interpretation, however, still leaves a number of questions unanswered. How, for example, should the longer range (over 600 kilometers) nuclear SLCMs deployed on surface ships or multi-purpose submarines be classified? In terms of technical characteristics, the vehicles are either similar or identical to the ground-launched cruise missiles (GLCMs) that were banned and eliminated under the INF Treaty and the ALCMs covered by the START treaties, as well as to the conventionally-armed SLCMs and ALCMs being deployed by the U.S. Navy and Air Force in big numbers. Such nuclear SLCMs were limited to 880 missiles for each side under START I (with no verification measures), and they have not even been mentioned in the New START Treaty.

Next, some types of nuclear air bomb (such as the U.S. B-6) are carried by both heavy bombers and tactical attack aircraft (the B-2A and F-16, respectively, and in the future, the F-35 as well).

Finally, there are also intermediate-range and tactical systems in the armed forces of several other nuclear-weapon states besides the United States and the Russian Federation (France, India, Israel, North Korea, Pakistan, and probably China). These nations, however, do not consider such weapons to be sub-strategic. In particular, within the NATO context, the French Strike Force includes 60 *Mirage 2000H* aircraft and 24 *Super Etendards*, a carrier-based fighter-bomber capable of delivering to target about 60 air-to-surface (ASMP, for *Air-Sol Moyenne Portée*) missiles. Although such systems could also be considered to be TNWs, France sees them as part of its strategic forces.

However, the greatest problem is that TNWs are delivered by dual-purpose vehicles (medium bombers, fighter-bombers, short-range offensive missiles and surface-to-air missiles, ship and submarine armaments, and large-caliber artillery). Such delivery vehicles are then deployed on dual-use launch platforms and multi-purpose ships and submarines. This means that, unlike SNFs, TNWs cannot be limited, reduced, or eliminated, and these activities cannot be carried out or controlled by eliminating launchers, delivery vehicles, and sea-launch platforms (such as ballistic missile submarines), inasmuch as nearly all of them are assigned to general purpose forces primarily for carrying out conventional military operations and have been partially covered

by other treaties (such as the Treaty on Conventional Armed Forces in Europe – CFE, in reference to combat aircraft and artillery). For this reason, to make any significant cuts in TNWs under an SNF-style methodology would imply making radical reductions in systems and weapons in the air forces, navies, ground forces, and anti-aircraft defense units of the nuclear nations.

Non-Strategic Nuclear Weapons in the United States and Russia

Neither country publishes any official information on its non-strategic nuclear weapons.

The United States. Experts estimate that the United States had over 11,500 weapons of this type by the early 1990s (over 7,000 in Europe, another 1,000 in Asia, 2,500 in the Navy, and 200 to 300 weapons on U.S. territory as part of the country's anti-aircraft system). Another 4,000 nuclear devices were held in strategic or tactical reserve.³ Under a 1991 Presidential Initiative, the United States withdrew to its territory and eliminated all tactical nuclear warheads of its ground troops at overseas bases, removed all TNWs (except long-range SLCMs) from its surface navy and multi-purpose submarines, and destroyed 50 percent of such weapons.⁴

Based upon unofficial estimates, the United States currently has about 500 TNWs, including 100 Tomahawk SLCMs (TLAM/N) for multi-purpose submarines at the Kings Bay and Bangor Navy bases in the United States, and an additional 190 warheads for the SLCMs (W80-0) in storage. The United States also has 400 air bombs (B-61-3 and B-61-4), of which around 200 are at the six U.S. Air Force storage facilities in five NATO nations (Belgium, the Federal Republic of Germany, Italy, the Netherlands, and Turkey). These bombs are designed to be delivered by USAF F-16 fighter-bombers, as well as by Belgian or British aircraft of the same type and by the German-Italian Tornado tactical strike aircraft.⁵

Under the new U.S. Nuclear Doctrine, all Tomahawk nuclear SLCMs will be eliminated, but the B-61 air bombs will undergo modification to extend their service life, and security will be improved to prevent their unauthorized use. They are viewed as being within the context of Washington's nuclear guarantees to its allies, and the question of their future deployment in Europe will be subject

to consultation among them. The new F-35 tactical fighter-bomber is capable of delivering these aircraft bombs.⁶

There is insufficient reliable information available concerning the nuclear warheads stored at centralized facilities within the United States. It is known that these warheads are stored at several warehouses on Navy and Air Force Bases, at individual centralized storage facilities, and at the warehouses of the Pantex (Amarillo, Texas) factory for munitions assembly.⁷ They have been assigned to various reserve categories, with some of them available for immediate re-commissioning and another portion designated for use as spare parts. The third portion consists of warheads that have been awaiting their turn to be dismantled and have their nuclear material removed for its long-term storage or recycling for peaceful or military purposes (assembly of new warheads).

According to official data, in 2009 the United States had 5,113 operational nuclear warheads in its SNFs, on TNWs, and in stockpiled combat-ready reserve. Independent experts have estimated that another 4,200 warheads in the United States are in storage awaiting recycling.⁸ This number will increase as further SNF reductions are made under the New START Treaty, which calls for a significant portion of the reductions to be carried out by removing a number of warheads from multiple-warhead missiles and stockpiling them in storage facilities, as well as by unloading a portion of the SLBMs from submarine launchers and also placing their warheads into storage.

The Russian Federation. In contrast to its SNFs, Russian non-strategic nuclear weapons are even more shielded by secrecy than those of the United States. According to some estimates, by the end of the 1980s their numbers had reached 22,000.⁹ In response to the U.S. step and to the dissolution of the Warsaw Pact and the Soviet Union, in 1991-1992 a number of radical measures were announced in a unilateral USSR/Russian Presidential Initiative which ordered the removal of all ground-force TNWs to bases at the nuclear munitions assembly plants and centralized storage facilities, and their subsequent complete destruction, thus eliminating 30 percent of Navy TNWs, 50 percent of the anti-aircraft missiles, and 50 percent of Air Force TNWs. The proposal was also made to transfer all Air Force TNWs to centralized storage facilities simultaneously with the United States, but this failed to find support in Washington (since it would also affect foreign USAF TNW bases, which were a symbol of Washington's nuclear guarantees to its allies).¹⁰

According to existing data, by 2000, all Russian Navy and Air Force TNWs had been transferred to centralized storage and 30 percent of them had been liquidated; 50 percent of the Air Force TNWs and 50 percent of the ground-to-air missile warheads had also been eliminated. In addition, a portion of the nuclear warheads of ground force artillery, tactical missiles, and land mines had been scrapped.

Most experts agree with the estimate that Russia currently has about 2,000 intermediate-range and tactical weapons.¹¹ Approximately 500 of these are tactical nuclear air-launched missiles and bombs for the Russian 120 intermediate-range Tu-22M and 400 front-line Su-24 bombers. In addition, there are about 300 air-launched missiles, and air and depth bombs for naval aircraft, consisting of 180 Tu-22M, Su-24, Be-12, and Il-38 aircraft. There are also over 500 TNWs used in anti-ship, anti-submarine, and anti-aircraft missiles, depth bombs, and torpedoes on surface ships and submarines, including up to 400 long-range SLCMs on multi-purpose nuclear submarines. There are assumed to be 100 nuclear warheads for the interceptor missiles of the A-135 BMD system protecting Moscow, with another 630 warheads for the S-300 anti-aircraft missiles and other national territorial anti-aircraft defenses.¹² It is generally believed that such nuclear weapons are warehoused during times of peace at special storage facilities located at Russian Air Force, Navy, and Air Defense Force bases. As revealed by the tragic incidents with the submarines *Komsomolets* and *Kursk*, Russian nuclear submarines departing on sea patrol were loaded with one or several tactical nuclear missiles and torpedoes, although it is not known whether this practice continues today.

As noted above, during the 1990s all TNWs of the Russian Ground and Air Defense Forces, as well as the predominant part of tactical nuclear weapons of the Navy and Air Force, were removed to centralized storage facilities of the 12th Main Directorate of the Ministry of Defense (Nuclear-Technical Troops Forces), where they are stored in reserve or await disassembly and recycling. Representatives of the military and political leadership have announced that Russia's entire non-strategic nuclear arsenal is currently in centralized storage facilities.¹³ It is not clear whether this includes the storage facilities at Navy and Air Force maintenance and repair bases that have been transferred to the Nuclear-Technical Troops, or if it refers only to the previously built special centralized storage facilities. The latter are also used for storing warheads and other SNF weapons. Although

the number remains secret, foreign experts appear to agree on a total of about 8,000.¹⁴ However, the methodology used by the independent experts is also questionable, in particular their inclusion of the 630 warheads of the AAW missiles, which, according to Moscow's official statements, have all been moved to centralized storage facilities.

The operational tactical systems are being modernized with the new *Iskander* tactical missile, which can presumably be fitted with either nuclear or conventional warheads. It is possible that the new Su-34 front-line bombers may also have dual-use application.

Other nuclear powers keep information on their non-strategic nuclear forces completely secret. Experts estimate that China has about 100 to 200 such weapons, India has 50, Israel has between 60 and 200, Pakistan has 60, and North Korea has between six and ten,¹⁵ which would include intermediate- and short-range ballistic and cruise missiles and aviation bombs on attack aircraft. For some of these countries, such weapons represent all or the bulk of their entire nuclear capacity and are regarded by them as a strategic nuclear deterrent.

Strategic Priorities of the Sides

Following the end of the Cold War, the reunification of Germany, the dissolution of the Warsaw Pact, the disintegration of the Soviet Union, and the withdrawal of Soviet combat troops from Central and Eastern Europe, the threat of a general forces attack on the NATO countries vanished. For the entire forty years following 1945, this had been seen as the primary security threat for NATO, against which the nuclear deterrence and nuclear guarantees of the United States were targeted, including through deployment of TNWs in Europe and conceptual planning of their first use in case of an attack by conventional forces using conventional weapons.

Nevertheless, the nuclear weapons that the United States alone currently has abroad consist of 200 tactical aviation bombs in five NATO nations (Belgium, the Federal Republic of Germany, Italy, the Netherlands, and Turkey). Over recent years, the United States has withdrawn its TNWs from Great Britain and Greece. Once tactical nuclear weapons had been removed from U.S. surface ships and submarines, Japan (where the 7th Fleet was based) was also removed from the list. In the remaining NATO states and between the Allied

partners very serious discussions continue about having TNWs removed from their territories.

It would appear that the United States sees this as an additional military advantage over Russia, since as far as Russia is concerned, the striking ranges of U.S. forward-based TNWs make them equivalent to strategic weapons. These weapons are also probably seen as being a kind of political “harness” for the NATO allies, although under the new U.S. nuclear doctrine, the role of such weapons has been dramatically diminished, and it has been stated that the United States would be prepared to remove these weapons to its territory with the agreement of its allies.

With the eastward expansion of NATO, the previous superiority of Soviet and Warsaw Pact general purpose forces has been replaced by an almost identical superiority of NATO over Russia and the CSTO nations.

In this connection it becomes clear that Russia sees TNWs primarily as an instrument for neutralizing NATO’s **superiority in general purpose forces** (especially considering NATO’s expansion to the east). For this reason, Moscow is less than eager to enter negotiations on this subject. In the past, the United States had also avoided this, wishing to retain its forward-based nuclear forces in Europe.

Second, Russia probably sees its own superiority in non-strategic nuclear weapons as a compensation for the growing gap between it and the United States in strategic arms (which the New START Treaty will even up somewhat, but not entirely).

Third, TNWs represent a counterweight against the nuclear forces of third nations, essentially all of which have nuclear ranges that include Russia. The SNF cuts under treaties with the United States elevate the relative role of Russian non-strategic forces in deterring and targeting the nuclear countries of Eurasia.

Fourth, there remains the issue of using TNWs to retaliate for an attack by only general purpose forces using conventional arms (in particular the U.S. long-range precision-guided weapons (PGWs) that rely on the latest orbital information support systems for reconnaissance, targeting, navigation, and communications). Although it has not been a topic of public discourse, there remains a certain strategic logic to such a function. If the use of SNFs to retaliate against non-nuclear aggression (an “aero-space attack,” for example) could immediately cause an escalation into total nuclear war, then the use of TNWs against an adversary’s navy and air force bases, ships, and

non-nuclear SLCM submarines may be considered to be a more appropriate response and means for deterring an “aero-space attack.”

The rising military might of China, which shares a more than 5,000 kilometer border with the Russian Federation, must also not be ignored, although this topic has been avoided in official Russian documents.

Preconditions For TNW Negotiations

The priority attached to the threat of the expansion of NATO and the base infrastructure of the Alliance up to the borders of Russia in the Military Doctrine of the Russian Federation of 2010 was greatly exaggerated,¹⁶ at least in terms of an actual threat of military attack on Russia and its allies.

The collective forces of the block have undergone a reduction (35 percent of the ground forces, 30 percent of the navy, and 40 percent of the air forces have been cut since the early 1990s.) U.S. troop numbers over the same period have also declined (by two thirds, from 300,000 to 112,000). Overall, NATO forces are below the initial CFE’s 1990 maximums by 42 percent for personnel, 25 percent for armored vehicles and artillery, and 45 percent for combat helicopters and aircraft.

In other words, the increased number of NATO members does not automatically imply a correspondingly higher number of Allied troops and forces because of an offsetting reduction in force levels among certain member nations, especially of the United States forces based in Europe and of such nations as France, Germany, Italy, Poland, and Spain. Today’s 28-member Alliance has substantially fewer total troops and weapons than did the 16-member Alliance in the early 1990s. This would hardly be the case if the Alliance were really preparing for large-scale aggression against Russia.

The development of U.S. long-range PGWs that rely on space-based information systems does indeed complicate Russia’s military planning; however, even this threat has to a certain extent been invented, since the consequences of using the latest conventional weapons to attack a powerful nuclear state (which is what Russia is) would incomparably overwhelm any imagined benefits from such aggression.

It is no less important to note that, with the Cold War over and economic, social, and political interdependence in the world increas-

ing through globalization, it would be difficult to imagine a single motive the United States or its allies might have for attacking Russia (certainly not one that would justify the enormous costs and dangers for all sides).

In any case, Russia cannot afford to ignore the trends that have developed to its disfavor in the global and regional balances of conventional and nuclear forces (even if they largely result from the failures of its own military reform over the past 15 to 17 years.) The new Military Doctrine places a very clear emphasis on these defensive and security problems, and this view cannot be ignored. The way to alleviate Russia's concerns is not by trying to convince it that the official Russian perception of the problem has been incorrect; rather, every effort must be made to remove such obstacles through agreements and adjustments to NATO's military policy.

In the first place, considering the internal changes that have taken place in Ukraine and Georgia's territorial problems, NATO membership for these two countries should be indefinitely delayed. As relations between NATO and Russia and NATO and the CSTO develop (primarily with respect to stabilizing Afghanistan), future expansion of NATO to the east without Russia's consent should become impossible.

Such guarantees would best be incorporated into the new European security system proposed by Russia that would also maintain the territorial integrity and sovereignty of the post-Soviet states. The military component of such a system could revive the system and process of conventional forces and weapons reduction and limitation in Europe, a framework that would also be suitable for addressing the issue of non-expansion of NATO's infrastructure to the east. Of critical importance would be the formation of a large joint CSTO-NATO rapid response unit for peacekeeping and other operations outside of Europe (**including in Afghanistan**), and a similar Russia-European Union force for operations on the European continent.

Joint assessment of missile threats and cooperation in developing and deploying U.S.-EU-Russian BMD systems must replace unilateral actions by the United States and its allies in this area.

Limits on long-range PGWs have partially been addressed under the New START Treaty and will be further discussed during subsequent negotiations, with the remainder being dealt with in the context of a special new series of arms limitation agreements and

confidence-building measures and cooperation between Russia and the United States.

In linking this “package” of decisions and agreements, Russia could agree to detailed discussions with NATO and the United States on the problem of non-strategic nuclear weapons.

As for the latent threat from China looming over Russia’s eastern borders, a solution might be found along the lines of a multilateral treaty signed to limit conventional forces and weapons within a 100-kilometer zone stretching along both sides of the Sino-Russian border. Against the backdrop of progress in enhancing mutual security in Europe and NATO-CSTO-SCO cooperation in Afghanistan, additional measures should be undertaken to limit Russian and Chinese armed forces along their common border and extend this zone substantially (to 200 to 300 kilometers on each side of the border between the two friendly nations). In this case as well, negotiations on TNWs would be tied to the conclusion of a package of agreements covering security along Russia’s eastern borders.

Possible Solutions

The current renaissance of the idea of nuclear disarmament and progress in SNF reductions inevitably raises the issue of TNWs. Moreover, in linking this question to a discontinuation of NATO expansion eastward and to future progress on the CFE Treaty, Russia has been fully justified, and may succeed in achieving both goals.

Paradoxical though it may appear, the New START Treaty has also had an indirect effect on the non-strategic nuclear weapon problem, although not at all in a way that the U.S. Senate would like or that Western politicians and analysts would perceive as correct.

At the START negotiations, the United States pursued its own interests and induced Russia to agree to count nuclear weapons only if they have been “operationally deployed,” and by doing so almost took TNWs off the table. After all, “operationally deployed” warheads are those that have actually been placed on SLBMs and ICBMs. Heavy bomber loads (ALCMs and bombs) are not counted as individual warheads under the New START Treaty because they are removed from the aircraft and stockpiled during peacetime.

Under the same principle (and based upon precedent), TNWs are also not “operationally deployed,” since during peacetime they, too,

are removed from their delivery vehicles and stockpiled at navy or air force bases or at centralized storage facilities within Russia and the United States.

In spite of some U.S. ideas to the contrary, it would not be possible to combine the reduction and elimination of TNWs with reductions of SNFs, inasmuch as TNWs are delivered by such dual-use vehicles as aircraft, short-range missiles, surface ship or submarine weapons, and artillery. In essence, the limitation, reduction, or elimination of TNWs involves the removal of nuclear explosive charges from dual-use missiles, projectiles, and torpedoes, or from the weapons systems aboard multi-purpose aircraft, ships, and submarines. Thus, as noted above, the reduction of TNWs, unlike SNFs, can never be achieved or controlled through the elimination of delivery vehicles.

For this same reason, it will be incredibly difficult to agree on reducing TNWs to some level and to control such reductions. After all, the two sides would have to agree to inspections not of deployed (and non-deployed) missile launchers and delivery vehicles, but of containers of stockpiled bombs and warheads in storages. This would be a much more complicated task, especially since tactical nuclear munitions are often stored alongside their vehicles, with warhead and bombs removed from missiles or bombers under the START Treaty and with munitions slated for recycling. Furthermore, there are dozens of such warehouses and many thousands of warheads.

If a greater portion of (dual-use) delivery vehicles is retained, the elimination of TNW charges would be primarily a symbolic (not to mention complex and expensive) measure, if the exact number of remaining weapons cannot be verified, and it cannot be guaranteed that these types of nuclear munitions are no longer being produced or stockpiled as replacements for eliminated warheads that could be quickly put into service. For the same reason, the measure of destroying the casings of nuclear explosive charges (as called for under the INF Treaty), would not be very effective. Since intermediate- and short-range missiles have been fully eliminated, there would be no place to which to return the headers of the two classes of missiles to service, but the situation with TNWs is totally different. Verification of such weapons at centralized storage facilities or the nuclear warhead manufacturer's factory warehouse (the final assembly shop in particular) assumes an unprecedented degree of openness in the most sensitive areas of military and technical activity, while the context of the New START Treaty implies less transparency, not more.

The same applies to exchanges of information on the numbers and types of TNWs in storage, unless they can be reliably verified. This means that any trilateral elimination of TNWs (by 50 or 80 percent, for example) or setting up a particular number as a limit would likely be unacceptable for the side that has far fewer weapons of this type (especially considering the difficulty of verifying the number each side retains.)

In this respect, the process of dismantling and destroying (or recycling) TNWs would be analogous technically and from the aspect of treaty verification to eliminating strategic bombs and warheads, which has not yet been raised as a topic. In the future, nuclear disarmament, if it expands to encompass elimination of the nuclear explosive charges themselves, will apply equally to strategic and non-strategic warheads.

For this reason, as a first step with regard to TNWs, the sides could agree to withdraw all tactical nuclear systems from their forward bases to centralized storage facilities deep within the country (i.e., essentially into reserves). To accomplish this, the two countries would need to first exchange information on the number of systems of that class at their navy and air force bases. As an option, agreement could first be reached on the TNWs of the U.S. and Russian air forces, and then the issue could be negotiated with respect to the two navies.

Under this scenario, the United States would first need to withdraw the 200 air bombs stored at six stockpiles in five countries of Europe, and Russia would remove the approximately 500 air bombs and missiles it has at Air Force bases located within its borders and place them into centralized storage facilities. Equality would also require that the United States not only withdraw its TNWs from Europe to its own territory, but also prohibit their future deployment on Air Force (and, subsequently, Navy) bases or anywhere else, other than at centralized storage facilities available for inspection.

It would be simpler to verify a complete withdrawal of TNWs from forward bases, since the storage sites, which are of known location and characteristics, would simply be left empty. There would also need to be a short-notice inspection agreement (similar to the one agreed to under START for ICBM, SLBM, and heavy bomber bases) covering air force and navy bases in both the United States and Russia (possibly including the bases of their allies). For this reason, although feasible from a practical point of view, such an agree-

ment might turn out to be an issue much more difficult and sensitive for the United States than for Russia, demanding of the United States more comprehensive measures.

Redeployment of the TNWs from their forward positions to centralized storage facilities would also provide the best security guarantee against the threat of their capture by terrorists, unsanctioned relocation or use. At the same time, such an agreement would mean that Russia would retain the ability to return TNWs to its troops if a threat to its security should arise on Russia's western or eastern frontiers. The same response measures would also theoretically be available to NATO. However, the possibility of a mutual return of TNWs (and "unloaded" SNF warheads) to deployed delivery vehicles would be a rather powerful deterrent if reliable control is insured. Moreover, judging from statements made by highest Russian military officials and the Pentagon, most of the TNWs have already been moved to centralized storage facilities in Russia and warehouses in the United States.

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CHAPTER 11

THE THREAT OF ACCIDENTAL NUCLEAR EXCHANGE

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Throughout the decades of the Cold War, the two superpowers saw their biggest threat as being a sudden nuclear attack by the adversary. Accordingly, one of the approaches they took in strategic forces development was to improve their combat readiness, in particular by reducing the time needed to prepare a ballistic missile for launch once authorization from the country's leadership had been obtained. This line of development reached its highest form in the operational concept of launching ballistic missiles based upon data acquired from early-warning systems. This concept became a component of the retaliation strategy and is known as "launch on warning." "Launch under attack" is a closely related term and implies launching while the adversary's warheads are hitting their targets.

Nuclear deterrence based upon a retaliatory strike capability does not necessarily require that forces be held on constant launch-on-warning alert. Nevertheless, without doubt, there is little question that this strategy is also one of the most tension-prone variants of the realization of the nuclear deterrence doctrine. Today, 20 years after the end of the Cold War, there are serious reasons to mutually review and fundamentally modify such concepts.

Retaliation Concept

This strategy placed the highest organizational and technical requirements on the Soviet Union and Russia. The ICBM flight time for an attack by the United States on the Soviet Union/Russia (or the reverse) is about 30 minutes. During this time, the launches of missiles need to be detected by early warning satellite and confirmed by long-range radar. The military personnel operating the systems and general command must then process this information before submit-

ting it to the supreme leadership of the country. If the leaders are not at the command center, the information is relayed using a mobile radio electronic terminal system known as the “nuclear briefcase.” Once a decision has been made at the highest level, the command is then passed through military channels down to SNF control stations, after which the missiles are launched and should still have the time to escape the zone hit by the adversary’s nuclear attack. In the early 1980s, once the SLBM (the U.S. Trident II missile and the Soviet RSM-52) had gained counterforce capabilities, the demands on retaliation systems tightened even further, with ballistic missile flight times to impact shortened to between 15 and 20 minutes.

Obviously, in order for this entire sequence of steps to work (while avoiding a missile launch based upon an erroneous assessment of the situation, as well as preventing an unsanctioned launch), all the technical systems and the “human factor” need to perform without fault and very quickly, and the missile systems themselves must meet the highest tactical and technical requirements.

The launch-on-warning strategy’s chief advantage was considered to be its ability to involve many more missiles in a retaliation strike, since a significant number of the missiles would be able to escape destruction at their launch pads. It was also presumed that the unavailability (nearly automatic) and immediacy of the retaliation would increase the deterrent effect and under certain conditions could even destroy that portion of the adversary forces that had not been used for the initial attack.

Nevertheless, the danger of accidental or unintentional nuclear exchange has always remained high due to the possibility of technological malfunction or incorrect interpretation of missile early warning system information. Even if all of the organizational and technical systems were to perform ideally, the leadership of the nation was allowed only seven or eight minutes to make one of the most apocalyptic of all decisions imaginable: whether to order a massive nuclear strike against the other nuclear superpower. Moreover, with the introduction of ever newer delivery vehicles with shortened flight time and systems that are difficult to detect after launch (the counterforce SLBMs mentioned above, the U.S. Pershing II IRBMs, GLCMs, and SLCMs), this time was reduced to near zero, blurring the distinction between retaliatory and preventive strikes.

During the Cold War years, there were numerous incidents of false MEWS alerts or crisis situations causing the SNFs to go

to heightened alert and putting the world on the edge of thermo-nuclear Armageddon. Incidentally, it is worthwhile to reference this fact repeatedly to those who currently assert that nuclear weapons saved the world from World War III. It is quite possible that what saved the world was pure luck and a fortunate combination of events, especially during the Cuban Missile Crisis of 1962 and the fourth Middle East war in 1973.¹

To the present day, the United States and the Soviet Union/Russia have remained the only nations to maintain major strategic nuclear arsenals at a high degree of launch readiness (measured in minutes), having the warning systems, combat command structure, and nuclear weapon delivery vehicles necessary to do so. Russia and the United States are also currently the only two of the nine nuclear-weapon states to have the concept of retaliatory counterstrike in their nuclear doctrines, as well as the corresponding technical foundation needed to deliver such a response. Other nuclear-weapon states lack effective counterforce capabilities against either Russia or the United States and could be subjected to a retaliatory strike without the need for a launch-on-warning concept. On their own, the other countries lack the warning and command systems required, and their missiles are not kept at a state of high alert readiness for launch.

Some uncertainty does exist with respect to the combat readiness of British and French submarines on sea duty, although in any case the sea-based missile forces situated outside their bases are not intended for “launch on warning” (due to the difficulties in ship-to-shore radio communication), and their survivability does not depend on it. China has steadily been developing its missile forces and the associated infrastructures of early warning and command, which may eventually give it a launch-on-warning capability.

There is sufficient ground to believe that Russia has around 1,100 to 1,300 warheads at a state of high alert on the overwhelming majority of the ground-based ICBMs and SLBMs on submarines at sea or in combat patrol mode at their bases. Some 1,200 of them are presumably deployed on delivery vehicles capable of being launched upon receipt of a signal from the missile early warning system, i.e. delivering a retaliatory counterstrike (ICBMs and SLBMs aboard submarines at bases). The United States keeps around 1,000 to 1,100 “operationally deployed” warheads at a state of high alert (with 400 of these on ICBMs and another 600 to 700 aboard SLBM subma-

rines on patrol); about 400 of these (on ICBMs) have retaliatory counterstrike capabilities.

The Advantages of a Launch on Warning

There is a strong adherence among political and military circles in Russia and the United States to the concept of “launch on warning.” Principally, this is in keeping with the very traditional military tenet that high combat readiness and the ability to respond immediately are both an enormous advantage and a primary goal in combat training and technological improvement of the armed forces and their equipment. In addition, there have also been a number of specific arguments advanced in favor of retaining this concept:

Under “launch on warning,” despite all of the difficulties with such an operation, the missile warning systems and command structures would still be essentially operating as in peacetime, having avoided predictable disruption by an adversary’s first strike.

If not launched upon MEWS signal, ground-based ICBMs would lose much of their counterstrike ability. Under such a scenario, there would be a large asymmetry in favor of the United States, since Russian SNFs rely significantly more on vulnerable fixed ground-based ICBMs (keeping the majority of its submarines at bases and its aircraft at a small number of airfields). At the same time, they have a lower counterforce capability against U.S. strategic nuclear forces, where the backbone is their naval component.

The probability that the United States will eventually implement an echeloned BMD system and introduce massive numbers of long-range PGWs increases the prospective importance of the launch-on-warning strategy for Russia in avoiding damage at deployment sites and saturation of its defense systems.

Inasmuch as the other side has the planning in place envisaging “launch on warning” and the means to execute it, any unilateral renunciation of this concept would only weaken the efficiency of deterrence.

Bilateral renunciation of “launch on warning” would be either unverifiable (as is the case with a de-targeting agreement) or too complex an issue for negotiation, if the goal is to achieve a technically feasible, verifiable, secure, economical, and balanced agreement, given the current asymmetry in forces between the two powers.

Despite the tendency during the Cold War years for the Soviet Union and the United States to broadly copy the weapons programs and doctrines of the other side, the main motive behind the launch-on-warning strategy was not in the fact that the other side had it, but that the likely adversary had the counterforce capability. The bilateral lowering of missile launch readiness would impact the two nations differently due to the asymmetry in their forces. For example, a substantial and verifiable reduction in the launch readiness of ground-based ICBMs (the main means of “launch on warning”) would enhance the survivability of U.S. strategic nuclear forces further, but would leave the Russian forces quite vulnerable to attack by Trident II SLBMs, SLCMs, and, in the future, “launch on warning” using cruise missiles and long-range, conventionally armed, precision-guided ballistic missiles.

The Risks of the “Launch-on-Warning” Strategy

Although the plans and means for “launch on warning” certainly demonstrate the highest organizational and technical level that the two powers have achieved in developing their SNFs, at the same time they should not be characterized as anything other than an anachronism of the Cold War, and a very dangerous one, at that.

First, given contemporary political realities, there is almost no chance that either Russia or the United States would launch a sudden nuclear attack against the other, which is what the strategy had been intended for. This is evidenced by a great number of facts. Russia, for example, keeps its stabilization fund (the foundation of the nation’s financial security) in western securities; energy security in the European Union is dependent upon Russia; and the United States relies on the Russian Federation to support its campaigns against international terrorism (Afghanistan) and nuclear weapon nonproliferation (Iran).

Second, considering the entirely different stakes involved in any imaginable conflict between the two powers, the threshold of “unacceptable damage” to an aggressor in a second strike may be lowered quite radically. Even the threat of losing a single (not to mention several) major cities would be quite sufficient to deter a nuclear attack by one of the powers against the other. Thus, it has become

no longer necessary that the predominant portion of ground forces survives a **hypothetical adversary first attack**. A **symbolic (if unverifiable)** confirmation of the profound de-escalation of the nuclear standoff was the series of agreements between the nuclear powers during the 1990s, with each **promising to shift targeting of its nuclear** missiles away from the other side and to lower the level of combat readiness of U.S. and Russian strategic bombers at the airbases.

Third, Russia's missile warning systems have **degraded substantially** since the collapse of the Soviet Union. In particular, the *Oko-1* early warning satellite constellation is a fraction of its former size,² while most of the missile early warning system radars (6 out of 9) have been left beyond the borders of Russia within the territories of not fully reliable CIS allies. This raises the more serious danger of an untimely **warning of nuclear attack or misinterpretation of information** leading to an order to launch missiles based on a false alarm (with all predictable catastrophic consequences).

Only recently has the Russian missile attack warning system gradually begun to recover,³ but to fully rebuild it would take many more years. Naturally, the major reduction in tension between Russia and the United States has also reduced their level of concern over the possibility of a sudden attack or the likelihood of an accidental nuclear war sparked by a "launch on warning" based upon a false alert. The logical resolution to the present situation, however, would be a bilateral renunciation of "launch on warning" by the two countries.

Fourth, this is especially true considering that the survivability of the SNFs belonging to the two powers is becoming less and less dependent upon this strategy. As the quantitative ceilings of strategic forces go down, the United States has been shifting more and more of its capacity to sea-based missile forces, refitting some of them for non-nuclear missions. Russia, for its part, has emphasized ground-based mobile ICBMs (*Topol*, *Topol-M*, RS-24, and *Yars* with multiple reentry vehicles) that could theoretically be launched on alert of a missile attack by the warning system, but would be able to launch a counterstrike without it in light of their improved survivability (from this perspective, the planned deployment of a new heavy silo-based ICBM would be a step backwards.)

Fifth, the proliferation throughout the world of nuclear weapons and missile technology, in particular among **irresponsible and unstable** regimes and extremist groups in the world, can only increase the likelihood of an accidental or provocative launch of ballistic

and cruise missiles (especially sea-based)⁴ or even of acts of nuclear terrorism, potentially including the capital cities of the great powers. Under such conditions, to keep SNFs under a launch-on-warning regime would threaten to trigger a spontaneous nuclear exchange.

Finally, sixth, maintaining heavy missile forces on one minute launch readiness to attack the other country can only reinforce the tense **strategic nuclear standoff between them, even at lower SNF levels**. This situation appears to suit many in Russia and the West quite well, **since they see no alternate way to try to consolidate patriotism internally and to rally foreign allies**. In reality, however, this is nothing but a **difficult obstacle to deepening cooperation** between the two powers in their struggle against the new common threats of the 21st century (particularly the proliferation of WMDs and their delivery vehicles, international terrorism, and terrorist attempts to acquire nuclear weapons).

Methods For Reducing Combat Readiness

Contrary to the opinion that is **widespread among proponents of disarmament, it would be neither simple nor quick to lower the combat readiness of the strategic forces**, following logically from nuclear weapons cuts. If the countries are striving for more than a purely symbolic gesture and want a verifiable series of technical and organizational measures that would reduce tension in the strategic balance between the two powers, then what they face might be as difficult and radical as the physical disarmament measures that in importance would be the next step following renunciation of the principle of first strike (which would lower the potential of a secondary (retaliatory) strike and generally reduce **the importance of mutual nuclear deterrence** in strategic relations between the two).

The time for such **measures might come following implementation of the 2010 New START Treaty, or upon completion of further nuclear disarmament negotiations** (for example, to a level of 1,000 or 1,200 warheads), or in parallel with the two, i.e., in the second half of the **2020s**. **Such a step-by-step process is required because the current SNF numbers and even the reduced numbers under the New START Treaty are still too high for any large-scale strategically significant technical measures aimed at lowering launch readiness.**

Thus, such procedures would be too expensive and require too much effort from the two sides.

At the same time, an across-the-board reduction in U.S. and Russian strategic nuclear forces to below 1,000 warheads (to limits of 800-500-300 warheads) might prove to be destabilizing. With smaller numbers of nuclear weapons, the tendency would probably be for the parties to **concentrate their SNFs against the most important targets (particularly missile early warning systems and communication and tactical operations centers)**, thereby increasing their focus on preventive strikes in cases of heightened military danger. Across-the-board cuts would also substantially exacerbate such issues as the need for the limitation of BMD defenses, the nuclear forces of third countries, and tactical nuclear weapons reductions, which would be very difficult to solve in one step. Stage-by-stage reduction in SNF combat readiness levels, to the contrary, could actually increase the stability of the nuclear balance at decreasing force levels and make it easier to resolve ancillary issues, as well.

However, there is no need to wait for many years for a negotiated reduction in SNF readiness or a joint renunciation of the retaliatory counterstrike concept. Some steps could be accomplished reasonably quickly; for example, the Joint Data Exchange Center (JDEC) project for sharing data on missile launches collected from the early-warning and notification systems could be resumed and reprofiled for real-time operation (i.e., it would not only collect and store information, but would also immediately share missile early warning system data on any missile launches on a global scale). Under the New START Treaty, the U.S.-Russia Shared Early Warning Agreement is also to be restored.

Subsequently, it could be agreed on a mutual basis to invite officers from the other side to visit supreme command points to observe full-scale training exercises of the missile forces and SNFs on the whole, so as to demonstrate that such exercises do not include launch-on-warning training programs. Finally, agreement could also be reached in the future on permanently detaching communications officers to command centers at various levels of the missile forces (Omaha, Nebraska, and the Vlasikha Center, Moscow region) to preclude the possibility of an inappropriate response to a potential false alarm. **In parallel and with the same goal, it would also be useful to establish a permanent direct hotline between the JDEC data acquisition centers and the SNF central control sites in the two countries similar**

to the hotline that already exists between the leadership of the two nations. This would be **particularly useful in light of the rising danger** of accidental or provocative missile strikes by third countries or acts of nuclear terrorism, which could instantly destroy the entire senior political leadership of the great powers.

As noted above, **at Moscow's initiative, the nuclear powers concluded** an agreement in the 1990s to stop targeting each other with their strategic missiles. Technically, this involved removing the flight programming from the **computer systems aboard the ballistic missiles** and replacing them with so-called "zero flight parameters." Being little more than symbolic PR gestures, such measures did nothing to affect the actual strategic balance; the changes to the software are not subject to verification and can be reversed within minutes.

More tangible measures are possible, but would require rather difficult negotiations and a favorable political climate of mutual trust. A considerable portion of the organizational and technical measures required to reduce combat readiness was developed by Russian specialists in preparation for the practical implementation of START II, **under which the delivery vehicles destined for elimination** under the Treaty were to be deactivated using agreed-upon rules. **Such measures could be verified under the framework of the inspection procedures for START I.** Deactivation implied bringing the elements of the missile complexes for each side from their initial condition into a state that would make a missile launch impossible unless they were returned to their initial state. The time that it would take to return them to their original state would vary and could be gradually extended on a mutual, balanced, and verifiable basis.

A draft Executive Agreement was also developed between the Presidents of Russia and the United States on Urgent Measures on Preventing Missile Launches Based on False Alarms that foresaw mutual renunciation of the launch-on-warning concept and technology.

As a result of the deterioration in relations between the powers in the late 1990s and a prolonged deadlock with the implementation of the START II and START III treaties, these measures were never implemented, and no such agreement was ever signed. Nevertheless, the methods that were developed at the time for a verifiable organizational and technical reduction in launch readiness of strategic missiles may yet be needed in the future.

The following methods were suggested for deactivating ICBMs:

- remove the missile warhead;

- disassemble the onboard power supply unit;
- dismantle the gas generators used to lift the protective roof of the silo;
- dismantle the pipelines of the pneumohydraulic system for ICBM prelaunch operation and launching.

For obvious reasons, SLBM deactivation methods would apply only to submarines **at their bases**. **According to available information**, Russian SLBMs, unlike the U.S. SLBMs, can be launched from surfaced submarines at their bases. Thus, they could theoretically be **ordered out of the strike area, based upon early warning system information**. The United States has never been known to follow this practice of maintaining launch readiness in base, since it has always had a significantly larger part of its SLBM submarines on combat patrol at sea. However, it would technically be possible to develop such a regime of elevated alert, so under the equality principle, deactivation would need to apply to both sides.

The parties could look into the following possible methods for reducing SLBM readiness for immediate launch:

- weld the SLBM launch tube hatches shut to prevent their opening;
- remove the warheads from deployed SLBMs;
- remove SLBMs from submarine launch tubes and place them into storage.

From the standpoint of the economics of deactivation, it would make most sense to select those readiness reduction measures that could be implemented at the lowest cost and still be verifiable for the other side at a level that it would consider acceptable.

If the warhead removal method of deactivation is used, combat service would be possible only after the warheads have been replaced by electronic imitators. The detached warheads would be packed, transported, and stored in special containers in warehouses at ICBM bases or centralized storage facilities.

It would take at least 20 to 30 minutes to return a stationary ICBM without warhead to combat readiness (i.e., to re-install its warhead), and over 30 minutes for a mobile ICBM. It would take even longer if they have been in centralized storage, and would require using a special transport to deliver the warheads to the ICBM base.

Although this method of reducing combat readiness by removing warheads from deployed SLBMs requires that there be corresponding storage sites provided for the detached warheads, it would nonetheless

not require any additional money to be spent on maintaining the deployed SLBMs in operational condition. To reinstall the warheads on each SLBM would take at least three hours. Consequently, it would take between 48 and 72 hours to install the warheads on all of the SLBMs to be deployed on each submarine, depending upon the number of launch tubes on the various classes of SLBM submarine. **It would take substantially more time if the warheads have been removed from the base to centralized storage.**

The method of reducing combat launch readiness by removing the SLBMs from a submarine's launch tubes and placing them into storage would be the most time-consuming in terms of restoring launch readiness. Although under current U.S. practice, a portion of a submarine's SLBMs is stored in the loading tubes, which permits a fairly rapid reload of all of its launch tubes (48 to 96 hours for an Ohio class submarine), the technology for loading the SLBMs into loading tubes has remained quite labor and time intensive, and the time required to bring a single strategic submarine to launch readiness could be as long as 30 days, assuming that there are enough loading tubes available.

At the same time, all of the measures described above would also allow complete monitoring over the technical conditions of nuclear safety on patrol and would allow remote electrical checks to be made; in addition, they could be conducted in parallel with any scheduled repair or maintenance work. The missiles could not be launched until restored to their previous condition, since in deactivated mode their launch sequence controls are automatically blocked.

The air component of the U.S. and Russian nuclear triads has not usually been associated with the launch-on-warning concept. Unlike ICBMs in fixed or mobile launchers or SLBM submarines at sea on patrol, bombers would not survive a nuclear strike on their bases and would be able to escape destruction only if they succeeded in making a quick takeoff. Unlike missiles, however, aircraft can be recalled to base in case of a false alarm. **In a crisis situation, bombers could be placed on 15-minute alert (with the aircraft fueled and parked at the end of the runway, weapons secured in bays and on pylons, and the flight crews in their cockpits).** Some of the aircraft could be designated for flight patrol, where they could remain aloft for prolonged periods (up to 76 hours for the B-52 heavy bomber).

Nevertheless, once the reduction in missile launch readiness has reached a certain level, the aviation component would have

to be included in the complex of measures called for under a verifiable “deactivation” process, in light of the flight time for bombers to reach their targets (seven to ten hours), which would be less time than it would take to return missiles to their previous state. Thus, **the strategic air force could develop into a means for delivering a disarming strike.**

For bombers, the deactivation measures could be based upon the principle of conversion to non-nuclear operation stipulated under START I, which included a technical aircraft refit verifiable by the other party that would prevent the bomber from carrying nuclear ALCMs, and a requirement that nuclear and non-nuclear heavy bombers be based separately and that no nuclear weapons be located within a 100-kilometer radius of the airfields where the converted bombers are based.

However, in light of the mounting concern in Russia about strategic precision-guided conventional weapons (including non-nuclear ALCMs), Moscow will **hardly be likely to find this “deactivation” approach acceptable. No matter how the issues of converting heavy bombers to carry only conventional weapons is resolved in the long run, the deactivation of nuclear heavy bombers, as with the missiles, must preclude their rapid use without having been returned to their initial condition.** Such measures could include, for example, removal and storage of engines, internal and external launchers for missiles and bombs, etc., at a site situated at a certain distance (for instance, that same 100 kilometers) from the base.

Based upon the calculations of Russian experts, the restoration period **could take between 100 and 500 days, depending on the original number of strategic weapons and the deactivation methods.** For smaller force numbers this would be accordingly shorter, which is another argument against making across-the-board reductions in SNFs below a level of about 1,000 warheads. Otherwise, overall instability in the event of a crisis could be further exacerbated by the ability of one side to **overtake the other in restoring its deactivated forces,** and by the incentive for it to deliver a first strike to take advantage of this lead, or a preventive attack to deny the other side this advantage.

For this reason, after SNF levels have been cut to about 1,000 warheads, it would appear best to proceed along the path to ever deeper **verifiable and balanced technical reductions of readiness levels** and the simultaneous expansion of the portion of SNFs covered

by such measures. At a certain stage, this deactivation could be essentially transformed into a strategic weapons dismantling process and their subsequent decommissioning.

For example, at the first stage, the SNFs of the two powers could be deactivated to a level where only 700 to 1,000 warheads remain combat-ready. This would initially essentially deprive the United States of its launch-on-warning capabilities, while **limiting the number** of such weapons for Russia, but to compensate for this, the United States would retain a greater number of battle-ready forces at sea. Such forces, it is true, would not be suitable for “launch on warning,” but also would not need to be for their own survivability, and unlike the unloading measures provided for reduction of strategic warheads under START I and the New START Treaty, the deactivation would assume complete removal of missile warheads, extraction of missiles from launchers, **or some of the launcher disassembly measures** described above.

The next stage could reduce the number of combat-ready forces first to 500 warheads and then to 300 to 200. Inasmuch as such measures would not apply to submarines at sea nor to mobile ICBMs on their deployment itineraries, the numbers of these outside of their bases would have to be reduced (to lower the so-called “operational intensity ratio”). This would essentially eliminate the counterforce threats to Russian ICBMs, **enabling Russia to scale down its ability** to deliver a launch-on-warning attack. The remaining combat-ready forces of the two countries would be exclusively tasked with maintaining the ability to deliver a “deep” retaliatory strike using limited but sufficient means in strict compliance with the principles of strategic stability.

Obviously, the measures described above cannot be carried out in isolation. As the two powers reduce their SNFs and progressively reduce their readiness for “launch on warning,” the **associated strategic problems will become ever more prominent: the role of ballistic missile defense systems, restrictions on the nuclear forces of third countries, tactical nuclear weapons (especially the U.S. TNWs in Europe), strategic conventional precision-guided weapons, and so on.** All of these problems have been addressed individually in the other chapters of this volume.

The method of pursuing verifiable reduction in combat readiness could ease the inclusion of **third nuclear countries in the arms con-**

trol process. It would probably not be possible to simply add China, France, and Great Britain mechanically to the U.S.-Russian negotiations. Such treaties are based upon a principle of general equality between the parties. The United States and Russia would be unlikely to agree to the same weapons limits as the other three countries, while the other countries, for their part, would probably not want to have their inferiority in nuclear forces legally recognized.

Should an agreement be reached on imposing equal limits on combat-ready nuclear weapons (say, at a level of 200 to 300 warheads), then the United States and Russia would still retain a great advantage over the other three states because of the numbers of deactivated missiles and aircraft. Although the other three nations, for their part, would formally have the right to enhance their SNFs with “deactivated” systems of their own, they would be unlikely to ever do so because it would be completely meaningless to deploy weapons that have intentionally been made non-combat-ready under the close supervision of other countries.

NOTES

- 1 *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers*, ed. Gareth Evans and Yoriko Kawaguchi (Canberra: International Commission on Nuclear Non-Proliferation and Disarmament, 2009), <http://www.icnnd.org/Reference/reports/ent/downloads.html>.
- 2 See: V. Misnik, “First Echelon of Missile Warning Systems,” *Vozdush.-kosm. oborona* 50, no. 1 (2010).
- 3 I. Kramnik, “Missile Attack Warning System Arithmetic: Subtract Two Dneper, Add a Voronezh,” *RIA Novosti-Arsenal*, Feb. 26, 2009.
- 4 The ship- and submarine-launched SLBMs and SLCMs pose a particular danger, with an appropriate reprisal complicated by the difficulty of identifying the responsible country.

CHAPTER 12

**NUCLEAR WARHEADS
AND WEAPONS-GRADE MATERIALS**

Anatoly Dyakov

The nuclear weapons limitation and reduction process that Russia and the United States began over 20 years ago after the prolonged and fierce confrontation of the Cold War has by necessity included transparency and verification measures, usually drafted and implemented to provide both sides evidence and confidence that agreed-upon cuts in nuclear weapons within the framework of mutual nuclear deterrence would not upset the strategic balance. At the same time, the application of such measures has gradually worked to build mutual trust in matters of control over nuclear weapons and weapons-grade fissile material. In addition, the use of transparency and control measures during the nuclear arms reduction process has effectively supported and reinforced the nonproliferation regime.

Transparency and verification measures in U.S.-Russian nuclear arms reduction agreements have related primarily to delivery means: intercontinental ballistic missiles, submarine-launched ballistic missiles, and strategic bombers. For such purposes, both national technical means of verification and various inspection regimes have been used. However, these agreements have lacked transparency measures with respect to nuclear munitions, their elimination, or the nuclear materials they contain.

Using national technical means to control nuclear munitions would be impossible because of their rather small size. Such control could only be made to work with an adequate level of confidence through on-site inspections of the production (dismantlement) facilities, storage facilities, and delivery vehicles. However, the fact that the development, production, and maintenance of such weapons are held under the most closely-guarded secrecy precludes the use of the mechanism of inspection. Clearly, foreign inspectors would not be granted access for nuclear munitions verification unless a sufficiently high level of trust has developed between the respective countries.

For deep cuts to be made in U.S. and Russian nuclear weapons and for other nuclear states to be engaged in this process, international stability and security must be preserved. The participants in the process must be confident that none of the sides have hidden or removed from accountability even a small portion of their nuclear munitions or weapons-grade materials. Thus, the issue of transparency for nuclear warheads and nuclear materials has become one of the most pressing problems, requiring a practical solution.

It will take thorough and comprehensive study to apply transparency measures to nuclear munitions arsenals and nuclear materials. Obviously, each side's approach to this issue will depend on the laws and standards that regulate the handling of nuclear munitions and weapons-grade fissile materials. That means that any agreement would need to overcome not only the inadequate degree of trust between the two sides, but also differences in legislation and in definitions of what constitutes sensitive information. In this context, the experience of previous U.S.-Russia agreements controlling nuclear munitions and weapons-grade materials and their technical implementation measures would doubtless be of interest.

Elements of Transparency For Nuclear Munitions in Nuclear Arms Limitation Agreements

The first strategic offensive weapons limitation agreements (the Strategic Arms Limitation Treaty (SALT I) of 1972 and SALT II of 1979) did not broach the issue of nuclear warhead transparency. This was essentially a result of the state of relations between the two countries at the time, characterized by deep suspicion and mistrust, along with numerous political and technical reasons.

The first limited warhead transparency measures were developed and implemented for the Intermediate Range Nuclear Forces Treaty (INF Treaty) of December 1987, under which the United States and the Soviet Union agreed to eliminate all ground-launched missiles having ranges between 500 and 5,500 kilometers. The missile front sections, including the warheads without their nuclear explosive charges, were to be destroyed at designated sites.¹

However, the only procedures specified for eliminating these warheads were to either crush (flatten) their launch canisters or destroy them with explosives, while the issue of disposing of the war-

heads' nuclear cores, their nuclear explosive charges (removed from the warheads before the missiles arrived at the elimination site), was not addressed. The launch canisters were to be destroyed under the supervision of inspectors, who would first record the types and numbers of weapons being eliminated before witnessing the elimination process and preparing their inspection reports.

From the very start of the negotiations, the Soviet side had expressed its desire to convert some of the missile bases previously used for the SS-20 missile (which had fallen under the terms of the INF Treaty) into bases for its mobile intercontinental SS-25 missile. For its part, the United States expressed concern that deployment of the SS-25 missile in closed launch containers could allow the Soviet side to avoid destroying some of its SS-20 missiles. Following protracted negotiations, the Soviet side agreed to allow U.S. inspectors to use radiation-monitoring equipment to measure the neutron intensity emitted from the SS-25 launch containers.

The purpose of these controls was to confirm that the SS-25 ICBMs did not have the same front section as the SS-20 missile, since radiation readings for a container holding a missile armed with a single warhead (SS-25) would differ from readings for a container holding a missile armed with three warheads (SS-20). If the measured neutron intensity matched a reference reading, the inspectors would be able to confirm that these containers actually held SS-25 missiles. If there was more than a 50 percent divergence between the measurement results and the reference readings, a procedure was to be followed for opening and visually inspecting the missile transport/launch container to confirm that it was not an SS-20.

Under START I, transparency measures applied only to the warheads of strategic delivery systems.

Under this Treaty, the two sides exchanged information on the number of warheads on their deployed ICBMs, SLBMs, and bombers. In accordance with START I, the parties were prohibited from launching or deploying ICBMs with more warheads than assigned to them. Numbers of ballistic missile warheads were to be verified at launch, using national technical verification means to count the number of warhead separation operations during each launch and confirm that they did not exceed the number of warheads assigned to that missile type.

In addition, START I provided for inspections to confirm that the ICBM and SLBM missile front sections did not contain more

warheads than the number allocated to them. No more than 10 such inspections could be carried out each year, with each inspection focusing on no more than one missile (ICBM or SLBM). The inspections would consist of visual examination of the missile front section lasting no longer than 15 minutes and carried out from a fixed location designated by the side under inspection to be located no further than five meters away from the missile and having a clear and unobstructed field of view. Prior to the visual inspections, the side under inspection was entitled to cover its warheads and other equipment located on the bus with a flexible cover in such a way as to avoid interfering with the inspection.

The equipment in the front section exclusive of the warhead was to be demonstrated by the side under inspection in such a way as to convince the side conducting the inspection that these items were in fact not warheads. The side conducting the inspection was entitled to use radiation detecting equipment to ensure that the items declared as non-nuclear were in fact non-nuclear.

Both sides repeatedly filed complaints against each other during the process of implementing the START I nuclear warhead control measures, which demonstrated that these measures were far from perfect. It should also be pointed out that the START I Treaty provided no measures for verifying nuclear weapons on strategic bombers and the warheads removed from decommissioned delivery vehicles.

U.S.-Russian Cooperation in the Development of Transparency Measures 1994-1998

During the Presidential Summit of January 1994, the United States and Russia agreed to set up a joint working group to “consider ...steps to ensure the transparency and irreversibility of the process of reduction of nuclear weapons.”² A Working Group on Nuclear Safeguards, Transparency, and Irreversibility was formed and began work in May 1994, with an agenda that included discussion of such issues as the potential for concluding cooperation agreements, sharing information on nuclear warheads and nuclear materials, holding selective inspections to verify the validity of such information, and for arranging and carrying out joint inspections.

The cooperation agreement was to have provided for an exchange of information between Russia and the United States on nuclear mu-

nitions that was secret under the laws of both countries and to guarantee the continued secure handling of this information. This agreement was to have created a new basis to successfully pursue the whole initiative on the transparency and irreversibility of the process of reduction of nuclear weapons. This information sharing on total numbers of nuclear warheads and nuclear materials and the possibility of selective verification of such information had the aim of providing the two sides with a basic foundation for a future transparency regime.

However, before arranging or carrying out joint inspections, U.S. and Russian experts were to cooperate in the development of non-intrusive measures to verify the dismantlement of nuclear munitions. The purpose of such measures was to confirm that the declared containers exiting the nuclear munitions dismantlement facility contained parts made of highly-enriched uranium or weapons-grade plutonium matching the weight and shape of the dismantled warhead components. Working in this area, between 1994 and 1995, U.S. and Russian experts developed and demonstrated a number of promising new methods for exercising control over such dismantlement activities.³

However, despite the importance attached to achieving progress in increasing transparency and irreversibility of the nuclear weapons reduction process in subsequent Joint Statements by the presidents of the Russian Federation and the United States of America (September 1995 and May 1995),⁴ by the autumn of 1995 discussion of this issue between the two sides had reached a dead end.

According to U.S. experts in the working group, one of the reasons was the lack of interest on the part of the Russian agencies (in particular, the Ministry of Nuclear Energy and the Ministry of Defense) in pursuing negotiations on transparency and irreversibility.⁵ The impending Russian presidential elections also played a negative part, since they distracted the administration of President Boris Yeltsin. At the same time, the transparency and irreversibility issues failed to duly capture the attention of senior U.S. administration officials due to the complexity involved.

It must be noted, however, that the subject was never completely dropped, and reappeared in the agreement reached during the Helsinki U.S.-Russia Presidential Summit of March 21, 1997. The two sides agreed that the number of basic elements of a future START III agreement should include “measures relating to the transparency of strategic nuclear warhead inventories and the de-

struction of strategic nuclear warheads and any other jointly agreed technical and organizational measures to promote the irreversibility of deep reduction. ...The Presidents also agreed that in the context of START III negotiations their experts will explore, as separate issues, possible measures relating to ...tactical nuclear systems, to include confidence-building and transparency measures.”⁶ The two sides further agreed to study questions related to transparency for nuclear materials.

Approaches to Nuclear Weapon Transparency by the Two Sides

It is important to note that the two sides developed substantially different approaches in the 1990s to discussions of transparency for nuclear warheads and nuclear materials. The United States considered it imperative that as much information as possible be obtained and that comprehensive verification be established for the entire arsenal of nuclear warheads and weapons-grade fissile material, as shown in the draft text of an agreement on data sharing on the two nuclear arsenals that the United States submitted to Russia in the summer of 1995,⁷ in which the U.S. side proposed the following:

- exchange of data on the numbers and deployment locations of all nuclear warheads and their fissile components, including quantities, types, and serial numbers of warheads produced and dismantled at each serial facility over the years of its existence;
- exchange of quantitative data on the annual production of fissile materials at each facility, including the degree of enrichment and composition.

In order to confirm the validity of the information submitted, it was proposed that selective inspections be carried out on-site, with a verification mechanism organized for the process of dismantling the nuclear munitions, removing, and subsequently recycling the fissile material.

As follows from the text of the joint statements, Russia supported efforts to develop transparency measures for existing inventories of strategic nuclear munitions, for the process of eliminating the strategic nuclear munitions slated for reduction, and for the weapons-grade materials deemed superfluous to national security

needs. However, Russia's interest in nuclear munitions transparency was motivated primarily by its desire to see the verified elimination of the U.S. ability to redeploy warheads ("upload potential") that it was getting under START II. This is why the Russian experts had wanted to establish a transparency regime that included only those strategic nuclear munitions (both deployed and in reserve) that were destined for elimination under the new nuclear weapons reduction agreements once these came into effect.

The Russian experts felt that a transparency regime for strategic offensive weapon warheads and their surplus weapons-grade fissile material should include the following primary components:

- initial declarations by the states party to international agreements detailing the parameters of their nuclear weapons and surplus fissile material subject to the transparency regime;
- periodic updates to the information contained in the initial declarations;
- a system of mutually-agreed measures to include mutual inspections of dismantlement sites for the nuclear munitions under reduction and of storage facilities for the weapons-grade nuclear components extracted from them so as to check the completeness and accuracy of the information contained in the initial declarations and their periodic updates.

The Russian approach was based upon the premise that the only measures needed were those aimed at confirming the actual dismantlement of the decommissioned nuclear weapons and the proper treatment of the surplus fissile material; however, such measures should not relate to any engineering, technological, or other information not directly connected to the process of reducing nuclear munitions. They should also be non-intrusive, i.e., be based only upon open, unclassified information. Finally, it was thought appropriate to start with only a limited system of measures, to be gradually expanded over time as the international climate improved and further trust developed between Russia and the United States.

Thus, although both sides agreed with the transparency regime's objectives and implementation mechanisms, they had differing approaches to defining its scope. For example, the categories and volumes of data that the U.S. side proposed for information exchange went well beyond what the Russian side was willing to agree to.

The Russian approach assumed that the transparency measures would be expanded gradually, while the U.S. approach strove to apply such measures to the entire nuclear weapons complexes of both sides to the maximum possible extent. These divergences in approach, as well as the negative impact on the full spectrum of bilateral relations that had been caused by NATO expansion and the debate in the United States over the merits of keeping the ABM Treaty, prompted the Russian side to leave the talks in 1999.

The Organizational and Technical Aspects of Transparency For Nuclear Munitions Dismantlement in Studies by U.S. and Russian Experts

Obviously, it would not be possible to achieve agreement on a transparency regime for nuclear munitions without first developing potential technical approaches for accomplishing it in practice. In order to establish the scientific and technical basis for making the corresponding political decisions, the U.S. and Russian sides both initiated programs to study the technical aspects of transparent nuclear munitions dismantlement.

The U.S. Department of Energy conducted a special study and produced a report evaluating the ability and preparedness of the nuclear military-industrial complex to implement measures of transparency and control over warhead dismantlement.⁸ Among the participants in the study were representatives of national nuclear laboratories and nuclear warhead production facilities.

One of the goals pursued by the researchers was to establish whether an agreement on cooperation (sharing classified information) was actually necessary for the verifiable elimination of warheads. Another goal was to assess the ability to reliably confirm the dismantlement of the various types of warheads, both strategic and tactical. Moreover, the scope of the verification procedures was also examined: would it be sufficient for them to be conducted only at U.S. Department of Energy facilities, or should those delivery vehicles, storage sites, and bases that are under Department of Defense control also be included?

It was assumed that the verification procedures would only apply to warheads that had been declared as superfluous to the interests of defense, and that the activities of the nuclear military-industrial

complex in maintaining the existing nuclear arsenal would not be subject to verification.

According to the study, the key control and verification activities conducted at the Pantex plant were as follows:

- declaration of the schedule for dismantling the munitions and components resulting from their disassembly;
- spot checking of documentation for the munitions, their storage locations, and the storage locations of their components;
- remote monitoring of the munitions, their storage locations, and the storage locations of their components;
- escort of munitions and components from storage to dismantlement site;
- continuous surveillance of the perimeter of the dismantlement facility's secure zone with accountability for every item delivered or removed;
- escort of munitions and components through the dismantlement area;
- pre- and post-dismantlement inspection of the dismantlement rooms;
- remote monitoring or direct observation of the dismantlement process;
- escort of nuclear components extracted during the munitions dismantlement process from the dismantlement area into storage;
- control over the recycling of non-nuclear components of the munitions (explosives, electronics, etc.) after the dismantlement has taken place.

Various options were considered and evaluated for the verification of dismantlement based on different combinations of key operations. Among the criteria for evaluation were the following: the level of certainty that the dismantlement has actually been performed; the potential for inadvertent loss of classified data; the impact upon the regular operation of the facility; the potential that an agreement could be achieved with the Russian side; and the cost of preparing for the inspections and of carrying them out. The results presented in the report indicated that the best option would include control measures over the munitions and/or their components starting at the storage facility and continuing through their escort from storage to the dismantlement area and back again (with

additional accompaniment of the munitions and their components through their dismantlement locations).

The participants in the study arrived at a number of interesting conclusions. In their opinion, by combining a certain set of proposed verification measures, a moderate level of confidence could be established in the munitions dismantlement processes without the need to conclude an agreement on classified information disclosure; however, any control measures for nuclear weapons, their dismantlement, and fissile materials would heavily impact operation of the entire nuclear weapons branch of the Department of Energy. The most difficult part of the assignment involved confirming that the object arriving at the dismantlement plant was actually a nuclear weapon. This stimulated the development of escort procedures that began at the Department of Defense facilities and relied upon the use of radiation profiling of the warheads and their components.

The Russian specialists developed the following key stages in the life cycle of nuclear munitions slated for reduction during the process of transparent dismantlement and recycling of extracted nuclear material:

- removal and transfer of a nuclear warhead to the repair and engineering base;
- dismantlement of the warhead and preparation for transport;
- transport of the containers with warheads to the facilities for their dismantlement;
- dismantlement of the nuclear warheads and removal of their components containing weapons-grade nuclear materials; preparation of these components for transport to temporary storage sites;
- transport of the weapons-grade component containers to temporary storage sites;
- storage of the containers with weapons-grade components;
- transport of the containers with weapons-grade components to conversion facilities for processing into unclassified types of nuclear material;
- processing of the weapons-grade nuclear components into unclassified forms and preparation of the processed materials for long-term storage;
- transport of the containers with processed material to their permanent storage locations;

- storage of the containers with processed material;
- transport of the containers with processed material to the recycling sites to be subsequently converted into fuel or other materials unsuitable for use in nuclear weapons.

It was assumed that every step of the nuclear weapons dismantlement process would be tracked by a detailed paper trail, including the documentation for the specific weapon, route chart records, and so on.

This approach was broadly similar to the U.S. study and its conclusions described above. As their U.S. colleagues had concluded before them, the Russian experts also felt that it was essential to establish confidence in the fact that an object removed from a delivery vehicle or from the arsenal that had passed through all of the dismantlement stages was in fact a nuclear device, and that it was the fissile material from this specific device that was being put into storage. This requirement was particularly necessitated by the fact that the arsenals of both Russia and the United States had warheads of various classes, differing construction, and with varying quantities of fissile material.

The first joint discussion of the subject of transparency in dismantling nuclear munitions was held between U.S. and Russian nuclear experts at the end of 1995 in Snezhinsk. These talks resulted in the signing of a joint research contract between the All-Russian Research Institute of Technical Physics and Sandia National Laboratories.⁹ Subsequently, once the All-Russian Research Institute of Experimental Physics in Sarov, the Nikolai Dukhov All-Russian Research Institute of Automatics, and the All-Russian Research Institute for Pulse Technology in Moscow had joined the effort, this joint project between U.S. and Russian nuclear centers became known in the United States as the Lab-to-Lab Program.¹⁰

The primary goal of the project as stated by the U.S. side was to initiate and maintain a technical dialogue with the Russian expert community and through this dialogue to create spearhead groups to advance the efforts toward transparency of Russia's nuclear defense complex.¹¹ The tasks of the program were as follows:

- define the process of dismantlement of nuclear munitions;
- identify and demonstrate the technical means that could be used to confirm actual dismantlement;
- identify measures to ensure control over the munitions during the entire process from dismantlement to storage of their nuclear materials;

- identify the technical measures required for transparency during the storage of plutonium and highly-enriched uranium.

Due to this topic's extreme sensitivity, laboratory studies focused exclusively on hypothetical dismantlement scenarios, identification of the potential technical means for ensuring transparency, and development of computer models for the munitions dismantlement process. The program consisted of four stages, the last of which assumed that a joint approach could be found to ensure transparency in dismantling nuclear munitions, and that the technical means thus developed could be demonstrated at the Russian nuclear munitions production/dismantlement facilities. Following development and testing, the various technical approaches to implementing the transparency regime could then be recommended to the governments of the two countries and included in future agreements on nuclear arms reduction.

By 1998, research under the next-to-last (third) stage of the program was approaching completion. At joint U.S.-Russian seminars in Snezhinsk and Sarov in April through May 1998, Russian experts demonstrated the methods they had developed for radiation monitoring of the isotope composition and mass of the fissile material and for diagnosis and destruction of the explosives in the munitions, as well as verifiable destruction of warhead casings. The experts had largely worked out a framework for monitoring the process of dismantlement of nuclear munitions and had considered and proposed possible technical and organizational measures to increase confidence in the fact that the dismantled items actually were nuclear munitions. These achievements offered the hope that a system of transparency would be developed and tested in prototype by 1999.

However, the Lab-to-Lab program never made it to its fourth and final stage. According to U.S. participants, this was due to the Helsinki Agreement of 1997, which drew the attention of the Russian Federal Security Service (FSB) to the project. In November 1998, at the insistence of the FSB, work under this program was halted, and its goals and content were submitted for interdepartmental review.¹² After that, it was never resumed.

Potential Measures and Scenarios For the Practical Implementation of Transparency in Nuclear Munitions Dismantlement

As noted above, a critical goal in applying transparency to nuclear munitions is to guarantee the authenticity of the decommissioned nuclear munitions subject to controlled dismantlement. However, this goal could be met by using a number of technical methods for identifying the nuclear munitions. The process of identifying the warheads removed from their delivery vehicles might proceed as follows: in the presence of inspectors, the warheads are placed into special transport containers; these containers are then marked and each fitted with a device for indicating unauthorized access.

Additional guarantees of the authenticity of the nuclear munitions could come from a radiation profiling process to record the passive spectrum of their gamma emissions and neutron flow characteristics. Both U.S. and Russian experts have demonstrated the feasibility of such a method.¹³ The measurement results (or radiation logbook) obtained under this method are recorded and stored in some type of archival medium by the monitoring side. During inspection of the munitions as they enter the dismantlement or storage facility, they are subjected to the same types of measurement using the same equipment and under the same conditions as for the original measurement, after which the new results are compared to the earlier ones to ascertain the unit's security and authenticity. The radiation profiling process may be accompanied by information barrier technology to avoid measurement intrusivity.¹⁴

Confirming the authenticity of warheads would likely be especially important in cases when they have not been removed from their delivery vehicles in the presence of inspectors, but are already located at the storage facility. The monitoring side may suspect that such units are dummy warheads containing a lesser amount of fissile material. This would also be a situation where the radiation profiling method could be used. In order to do so, the inspecting side should be allowed to conduct radiation measurements on a number of randomly-selected weapons of the same type removed from their delivery vehicles and placed into containers. Comparison of the radiation profiles of munitions arriving from storage for dismantlement and weapons removed from their delivery vehicles using the agreed-upon method-

ology should allow the inspecting side to establish that no deception has taken place.

The use of radiation profiling and unique individual markings on munitions containers would allow the process of transparent dismantlement of nuclear weapons to be structured of the following three stages:

During the first stage, the two sides would declare and monitor their surplus nuclear munitions and locations. Then, in the presence of inspectors, the nuclear munitions designated for controlled dismantlement would be removed from their delivery vehicles or from storage and placed into containers, which then would receive unique individual markings. These containers would be fitted with devices to prevent unauthorized access. If necessary and agreed, the monitoring side would also record the radiation profile. Subsequently, the nuclear munitions would be moved either to a temporary storage facility or the dismantlement facility itself. During temporary storage, the uniquely-sealed containers could be subjected to random checks.

Stage two would begin with the arrival of nuclear munitions at the entrance of the dismantlement facility, where the monitoring side would check the container markings and the access protection device, and would take and compare radiation profile readings for the particular nuclear munitions. Inspection would also be allowed of the rooms at the facility both before and after dismantlement to insure that there are no hidden areas within the confines of the facility. Radiation profile readings and markings could also be used during intermediate shifts of the containers and their fissile material components around the facility.

During stage three, the non-nuclear components extracted from the nuclear munitions (explosives, electronics, etc.) and warhead casings would be disposed of and submitted to the monitoring side in such a way as to maintain the secrecy of sensitive information. The containers and their fissile material components would pass through a verification check as they exited the facility and would be marked by the receiving and monitoring parties. Among the parameters that could be checked might be non-intrusive confirmation that the materials within the container are of weapons-grade quality. Subsequently, the containers could be sent to storage or (if their final disposition has been decided) to a conversion facility, where they would be subject to entry controls.

Verification of Fissile Materials Declared Superfluous to Defense Needs

For irreversibility to be achieved in the nuclear weapon reduction process, the two sides, in addition to their political obligations, would also have to institute bilateral measures of transparency for the surplus fissile material extracted during the nuclear munitions reduction process and dismantlement. The amount of this material extracted under the START I cuts was quite significant. Russia, for example, quoted a figure of 500 tons for its surplus highly-enriched uranium (HEU);¹⁵ the United States declared 178 tons of surplus HEU.¹⁶ With respect to plutonium, Russia and the United States reached an agreement in September 2000, under which each side committed to irreversibly utilize 34 tons of surplus weapons-grade plutonium. Both sides have by now gained considerable experience with transparency in the recycling of surplus fissile material, which may be of use in verifying the irreversibility of deep nuclear weapons reductions.

In February 1993, Russia and the United States concluded an Intergovernmental HEU Agreement (the HEU-LEU Agreement) for recycling the HEU extracted from decommissioned Russian nuclear munitions. Under this 20-year Agreement, 500 tons of Russian HEU was to be diluted to a level of four or five percent of the U-235 isotope and then shipped to the United States to be converted into commercial nuclear reactor fuel. The two sides also signed a Memorandum concerning the implementation of transparency measures to ensure the following:

- the HEU subject to the Agreement actually had been extracted from the nuclear weapon, and it was specifically this HEU that was being sent to the oxidation installation;
- the stated quantity of HEU actually had been reduced to LEU levels;
- the HEU delivered to the United States actually had been used to manufacture commercial nuclear reactor fuel.

Under this Memorandum, each side was entitled to send its observers to the facilities in the other country to observe the process of uranium sampling for technical analysis and the placement of seals on the containers. U.S. inspectors received the right to observe the manner in which the extracted HEU was being sent to the oxidation or fluoridation facility, as well as the way HEU was poured from testing

vessels into transport containers; they also had the right to observe the loading and unloading of the uranium during down-blend, including the way the Russian operators measured the mass, chemical makeup, and isotopic and natural compositions of the HEU. Russian inspectors were to have the right to observe the way the Russian HEU was being introduced and removed during its conversion into fuel at the U.S. production facilities.

In March 1994, Secretary Hazel O'Leary and Minister Victor Mikhailov signed a protocol on HEU-LEU Agreement transparency measures for the purpose of implementing the Memorandum's provisions.¹⁷ The protocol listed the following facilities as being subject to monitoring:

- the Urals Electrochemical Integrated Plant (UEKhK) and the Siberian Group of Chemical Enterprises (SKhK), where metal HEU extracted from the nuclear munitions was oxidized;
- the Zelenogorsk Electrochemical Plant (ZKhK), UEKhK, and SKhK, where the HEU oxides are fluoridated into uranium hexafluoride and subsequently diluted;
- the Portsmouth Gaseous Diffusion Plant, as well as plants in the states of North and South Carolina, Virginia, Missouri, and Washington, belonging to Westinghouse, General Electric, Babcock & Wilcox, Siemens, and Combustion Engineering.

Between 1994 and 1996, Russian and U.S. experts developed a number of appendixes to the protocol regulating the monitoring procedures at these facilities.¹⁸ In the framework of the implemented transparency measures, U.S. inspectors use portable equipment to carry out non-destructive verification of HEU enrichment levels at every stage of the LEU conversion process: upon arrival of the weapons-grade components at the SKhK plant, after rendering of these components into metal shavings, and during the process of fluoridating the shavings and converting them into uranium oxide.¹⁹ Under this method of control, the material remains inside sealed containers throughout the process. At the UEKhK, SKhK, and ZKhK enrichment plants, U.S. inspectors observe the process of collecting samples from the blend-down pipes (weekly) and their laboratory analysis at the plant.

The experience accumulated in implementing transparency measures within the framework of the HEU-LEU Agreement indicates

that they present no problems for relations between the two sides, which testifies to their reliability and credibility.

Transparency in Handling Weapons-Grade Plutonium Superfluous For Nuclear Weapons

In September 1993, the Russian Ministry of Nuclear Energy and the U.S. Department of Defense reached agreement on U.S. assistance to Russia in the construction of a facility for the storage of fissile material extracted due to nuclear arms reductions. However, a key condition was that the Russian side agree to implement transparency measures at this storage facility in order to confirm the following:

- the fissile materials in storage were recovered from dismantled nuclear munitions;
- the material was being safely and securely stored;
- no material removed from storage was reused for nuclear weapons.²⁰

In March 1994, Secretary Hazel O'Leary and Minister Viktor Mikhailov issued a Joint Statement calling for the creation of a working group to develop a list of control procedures and future bilateral inspections of plutonium and surplus HEU extracted from dismantled nuclear munitions under current and future nuclear weapons reduction agreements. The political objective of these inspections (which were to be carried out at each country's weapons-grade fissile material storage facilities) was to guarantee that these components would never be used for the production of new nuclear munitions. From a technical point of view, the goal of such inspections was to give each side the ability to confirm that the sealed containers presented for inspection actually contained components of weapons-grade fissile material.

The primary goal of the working group was to coordinate a list of nuclear component inspection criteria and to determine the technical methods required for such inspections. At the same time, the procedures were to satisfy two mutually contradictory requirements: on the one hand, they were meant to provide the inspecting side with a high degree of confidence in the results; on the other, however, they were also meant to prevent leaks of information about the weapons-grade nuclear components.

Following consultations, the experts of the two countries concluded that sufficient confidence in the inspections could be provided if their methodology and equipment included the option of determining the Pu-240/Pu-239 isotope ratio and the shape and mass of the plutonium components.²¹ Prototypes were also proposed and tested of the apparatuses for making such measurement while using information barriers to prevent the leakage of secret information.

Construction of the Mayak Fissile Material Storage Facility was completed in December 2003; its loading began in July 2006.²² However, to the present day, the two sides have been unable to agree on a final list of verification procedures for the plutonium stored at the site. The U.S. side insists on being able to confirm that the stored plutonium is weapons-origin. The Russian side opposes this, since it would mean extending these controls beyond the bounds of the facility.

A more successful example of transparency measures being applied to weapons-grade plutonium comes from the Intergovernmental Agreement that Russia and the United States signed in 1997 concerning reactors that produce plutonium. This Agreement stipulates the closure of three Russian industrial reactors, two in Seversk and one in Zheleznogorsk. Although these plants had been generating only thermal power and electricity since 1993, they were also producing plutonium (without a corresponding defense contract). The United States promised financial aid to fund the construction of replacement capacities for these plants, while Russia promised not to use the plutonium from these reactors in its nuclear weapons. The two reactors near Tomsk were shut down in the summer of 2009; the reactor near Krasnoyarsk was closed in April 2010.

The Agreement contains a number of appendixes covering control measures, including control over newly-produced plutonium after January 1, 1997. The plutonium (as PuO₂) was placed in containers and sent to storage.

The Russian side gave permission for observers to enter the storage facilities in order to give the U.S. side confidence in the following:

- the amounts of plutonium in the containers matched the amounts declared;
- the plutonium was newly-produced;
- the containers with plutonium had not been removed from the storage facilities.

A joint implementation and compliance commission established formal verification procedures for the Agreement. The two sides

relied on the Pu-240/Pu-239 ratio to confirm that the plutonium was obtained from low burnup fuel, i.e., as a product of processed industrial reactor fuel. Under the Agreement, this ratio may not exceed the threshold value of 10 percent. This verification procedure is based upon high-resolution gamma-ray spectroscopy and specialized software that uses information barriers. The results of these tests are displayed by a “yes/no” indicator.²³ The information provided by the Russian side on the age of the produced plutonium based upon the month and year of extraction is verified from the Am-241/Pu-241 ratio. This parameter was also measured using the high-resolution gamma-ray spectroscopy method that includes information barriers. The mass of plutonium in the sealed containers is verified using a combination of two measuring procedures: integral neutron detectors, used to measure the intensity of neutron emissions (which is proportional to the Pu-240 content), and gamma spectroscopy, used to determine the effective isotopic concentration of Pu-240 from the measured Pu-240/Pu-239 ratio. This methodology has proven its effectiveness in confirming that the amount of plutonium in the containers corresponds to the declared value.

Transparency and the Progress Toward a Nuclear-Free World

The idea of a world without nuclear weapons, which gained renewed popularity with the arrival of the Obama administration in the United States, boosted discussions on specific measures and approaches to achieve this. The U.S. and Russian commitment to this idea was noted in a Joint Statement that the presidents of the two nations released on February 1, 2009.²⁴ In a statement issued following the conclusion of the July 2009 G8 Summit in L'Aquila, Italy, the leaders of Britain, France, Russia, and the United States declared their willingness to work to “create the conditions for a world without nuclear weapons.” The UN Security Council Resolution of September 24, 2009, calling for an end to nuclear weapons in the world, was also supported by China.

Obviously, the process of shifting to a world without nuclear weapons cannot be completed overnight. It will require considerable effort and time to reduce nuclear weapons, which in turn will only be possible in an environment of global security and stability, with a re-

duced role for nuclear weapons in maintaining national security. It can be said with some certainty that elevating the fears that a country might violate its international obligations and conceal a portion of its nuclear arsenal to keep it from being completely destroyed will be of particular significance for this process. Such fears can be minimized only by implementing effective and transparent verification mechanisms for reductions in nuclear weapons and weapons-grade fissile materials. In this context, the experience that Russia and the United States have accumulated in controlled reductions in nuclear weapons will be of particular relevance.

U.S. experts believe that the next stage in bilateral reductions of nuclear weapons following the recently concluded New START Treaty should include non-strategic nuclear weapons. The verified reduction of non-strategic nuclear weapons will require that controls be implemented over the actual nuclear weapons directly rather than their delivery vehicles, as, for example, is the case with strategic nuclear weapons.

As the overview presented above shows, the problem of achieving the verifiable destruction of nuclear weapons has proven extremely difficult (even for Russia and the United States, which have considerable nuclear arsenals). Even greater difficulties may be expected in the future once these countries begin to pursue deeper cuts (to the levels of 1000 and then 500 warheads) and to bring other nuclear nations into the process. This is primarily due to the need to protect design information, the requirement that the governments disclose the numbers of their nuclear weapons and amounts of weapons-grade fissile materials, and the obligation to have them inspected. Such declarations can be valuable as sources of some amount of basic information, but during deep reductions in weapons they would obviously still need to be verified.

In preparation for making such declarations, each nuclear-weapon state will need to conduct a comprehensive check of the data for its entire nuclear arsenal. To avoid deception, the declarations must contain as much information as possible. Ideally, they should contain the chronology of nuclear material production and recycling, their quantities, enrichment levels, and storage locations, as well as the total number of nuclear munitions and nuclear components available (broken down by type and including the fissile materials and amounts used for their production) and the exact locations of the munitions. However, some of this information (particularly the loca-

tions of storage facilities for the weapons) would be extremely sensitive. It could therefore hardly be expected that the nuclear states would agree to implement a transparency regime for their entire nuclear arsenal all at once.

As noted above, the elimination of nuclear weapons will need to be accomplished in stages. With this in mind, the optimal approach would appear to involve initial declarations of the total amounts of weapons-grade nuclear material that each nation has available, with the transparency regime applying only to the nuclear munitions that fall under agreements on the staged reduction of nuclear weapons (including nuclear munitions that have not yet been deployed or are slated for dismantlement), as well as weapons-grade fissile material that the governments have declared to be superfluous to their defense needs. Such an approach would enable the nuclear-weapon states to gradually gain experience in transparency during dismantlement of nuclear weapons, thus improving their efforts and minimizing the risk that one country or the other might conceal a portion of its nuclear arsenal. The IAEA's involvement in the process of developing a verifiable process of eliminating nuclear munitions and control over the fissile materials extracted from them could prove decisive. One point worth remembering is that U.S. and Russian experts have already worked with IAEA experts in the period between 1996 and 2002 to study potential methods for properly controlling weapons-grade components produced from fissile materials.²⁵

Among the most crucial elements of the transparency regime are inspections, including inspections on short notice, which enhance confidence that both sides will meet their obligations in implementing the agreements. The goals of such inspections could include the selective verification of declarations to confirm that a particular location does contain the amount of materials and munitions declared. The experience that Russia and the United States (as well as the IAEA) have acquired from conducting inspections in South Africa and Iraq could prove useful in organizing such inspection activity in the future.

In conclusion, it must be noted that reliable verification of nuclear weapons reductions (up to the full elimination of such weapons) is an essential condition for the success of the nuclear arms control process. Verification becomes particularly important in the case of deep reductions, when even a small number of weapons escaping control

measures would be capable of undermining the stability of the entire process. Resolution of this problem would require the development of organizational procedures and technical methods capable of ensuring verifiable nuclear weapons cuts.

It should further be noted that the current inadequate level of trust between the parties concerned makes them unwilling to provide general information on their arsenals or more detailed information about nuclear weapons or their components. Only by overcoming the mistrust toward other nations and applying the transparency regime to their own nuclear arsenals will they be able to establish one of the conditions under which irreversible nuclear weapons reductions could succeed. To create such a regime of trust will not be simple; however, as the history of U.S.-Russian cooperation has shown, when the issue has been the reduction of nuclear weapons (in which both sides have a vested interest and the political will), they have been able to find a way organizationally and technically to implement measures of transparency.

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Part IV

**Strengthening
Nonproliferation
Regimes**

CHAPTER 13

A SYSTEMIC ANALYSIS OF NONPROLIFERATION

Alexei Arbatov

In terms of the number of countries it includes, the Nuclear Non-Proliferation Treaty remains the most universal international document ever (outside of the United Nations Charter), with 188 UN nations currently members and only four outsiders (India, Israel, North Korea, and Pakistan).

The Threats

Despite the NPT's unique inclusion of so many states, the dim prospects for nonproliferation in the early 21st century have instilled a growing sense of apprehension within the global community and among the politicians of most states.

The countries that have not yet joined the NPT are located in some of the most unstable regions in the world and are embroiled in conflicts that risk escalating to nuclear war. Iran, Iraq, Libya, and North Korea have all demonstrated the insufficient effectiveness of international controls over the nuclear materials and technology trade under the NPT (Article III), and in particular International Atomic Energy Agency (IAEA) safeguards.

The world has learned of the existence of a "black market" for nuclear material, technology, and expertise involving a number of NPT members (in particular Algeria, Egypt, Iran, Iraq, Indonesia, Libya, North Korea, and Saudi Arabia) initiated by individuals and organizations within countries that are not bound by the NPT and its accompanying restrictions and safeguards mechanisms (Pakistan).

The problems of a deteriorating climate and the anticipated shortages of hydrocarbon resources encourage intensive growth in the peaceful use of nuclear power over the next few decades, in-

cluding the proliferation of critical nuclear fuel cycle (NFC) technology and nuclear materials.

If the problems listed above are not resolved in a constructive manner, the probability of further nuclear proliferation and of the possible use of nuclear weapons in combat will grow, as will the risk that nuclear materials or munitions could fall into the hands of terrorist organizations.

However, of particular concern are the world's accumulated vast stockpiles of highly-enriched uranium and plutonium used for energy, military, and scientific purposes (an estimated 1,700 tons of uranium and 460 tons of plutonium). These stockpiles are located both in nuclear countries and in "threshold" or non-nuclear-weapon states, are maintained under the most diverse of reporting systems in what are by no means always safe storage conditions, and are not always reliably protected from theft or sale to potentially malicious buyers. A special April 2010 Washington Nuclear Summit provided the impetus for expanding international efforts to safeguard nuclear materials and ensure their peaceful use.¹

It could be argued with some justification that the next stage of proliferation, if it gains momentum, will not only trigger an exponential rise in the risk of nuclear weapons being used, but will also make this danger all but unavoidable in the foreseeable future due to a convergence of various risk factors.

Nonproliferation Policy as a System

One serious problem in reinforcing the nonproliferation regimes is the lack of any systematic approach. Various governments, non-governmental organizations, and experts have quite arbitrarily been proposing measures that follow no clear or recognized system of priorities and have not been coordinated as individual elements of a cohesive package. More often than not, the various initiatives are defined by attitudes toward one country or the other or by self-interest in one project or contract or the other, which severely interferes with efforts by the leading states to join forces and turns the issue of nonproliferation into an arena of competition between multiple political, economic, and military interests and an application of double standards.

Meanwhile, the goal of reinforcing the nonproliferation regime and its mechanisms can be divided logically into two elements: non-

proliferation in the context of states, and nonproliferation as it applies to extremist or criminal (terrorist) organizations. The former and the latter are essentially related, since extremists can gain access to nuclear materials or weapons primarily from nuclear states that have recently acquired nuclear materials or nuclear weapons.

With respect to states, the decisive factor is that the Nuclear Non-Proliferation Treaty has been signed by every country but four, and all four outsiders are already in possession of nuclear weapons. Accordingly, further proliferation of nuclear weapons can only continue through secret violations of the NPT or by openly withdrawing from the NPT under Article X and subsequently developing nuclear weapons. While Iran, Iraq, and Libya demonstrated the potential of the first approach, North Korea elected the second.

The two main ways of blocking these channels of proliferation follow logically from this.

First, the effectiveness of IAEA safeguards must be enhanced:

- all states must become party to the 1997 Additional Protocol to the Nuclear Safeguards Agreement, particularly those that have already been engaged in some sort of nuclear activity. The current situation, where in the fifteen years since the Protocol was concluded only about 70 countries have fully accepted its provisions, could hardly be considered satisfactory;
- the Nuclear Suppliers Group (NSG) should adopt a common rule that makes joining the Additional Protocol a mandatory precondition for receiving shipments of exported nuclear material, equipment, and technology;
- the scientific and technological base and, accordingly, the funding of Agency safeguard activities must be improved substantially.

The second line of action for strengthening the NPT's principles and mechanisms would involve improving the system of export controls: harmonization of national systems of export control, integration of China, India, and Pakistan into the process, and inclusion of the 2004 NSG Guidelines provision on "catch-all" export controls into national legislation by all countries participating in global cooperation on nuclear energy. In addition, the international documents that have already been adopted, in particular UN Security Council Resolution 1540, should be applied more effectively.

The third line of action for strengthening the NPT regime would strictly formalize procedures for withdrawing from the NPT and elevate its political significance:

- a declaration of intent to leave the NPT by a state should initiate intensive checks by the IAEA to determine whether the state has already violated the NPT or its Nuclear Safeguards Agreement; should be grounds for convening a special General Conference of NPT member states to consider the motives for the country's withdrawal from the NPT; and, if its motives are found to violate Article X or on the contrary to justify the state's withdrawal from the NPT (if it is not possible to resolve the problem without leaving the NPT), the matter should immediately be submitted to the UN Security Council for consideration as per Chapter VI and Article 41 of the United Nations Charter;
- all of the materials and technology acquired by a state up to the moment of its withdrawal from the NPT, irrespective of origin, must be used only for peaceful purposes and remain under IAEA safeguards;
- withdrawal from or violation of the NPT by a state for the purpose of using the materials or technology acquired through the peaceful atom program for military purposes may (if so decided by the UN Security Council) be seen as a reason justifying various sanctions or even the use of force against that state in the context of struggle against the threat to international security as per Chapter VII, Article 42 of the Charter of the United Nations.

The threat that a state might quickly withdraw from the NPT and develop nuclear weapons could be significantly reduced by limiting the proliferation of nuclear fuel cycle technology and by expanding the role of the multinational uranium enrichment and plutonium processing centers.

The fourth line of action in strengthening the NPT would involve enactment of existing and conclusion of additional multilateral treaties intended to serve as barriers to withdrawal or violation of the nonproliferation regime. This applies to two treaties in particular:

- the Comprehensive Nuclear Test Ban Treaty (CTBT) should be ratified by the United States and China as a criti-

cal link between “vertical” and “horizontal” nuclear disarmament, which would also encourage adoption of the NPT by India, Israel, and Pakistan, and would put a ceiling on the improvement of nuclear weapons by states that already have them, thereby setting up a barrier to nuclear weapons ambitions among the states that remain openly or secretly at the “threshold;”

- the Fissile Material Cutoff Treaty (FMCT), which prohibits the production of fissile materials (primarily weapons-grade uranium) for military purposes, should be concluded immediately; its scope should then gradually be expanded to include the corresponding verification mechanisms that would apply to both nuclear and non-nuclear members of the NPT, ultimately to include the “nonaligned troika” of India, Israel, and Pakistan.

It goes without saying that such measures would be possible to achieve only with unity of purpose among the great powers and the members of the UN Security Council. Since the steps proposed above imply an even stricter nonproliferation regime for non-nuclear states, the strong political position of the five nuclear powers presumes what is the fifth line of action: that they will continue to consistently move forward in the implementation of the obligations on nuclear disarmament that they assumed under Article VI of the Non-Proliferation Treaty; in particular:

- implement in good faith the New U.S.-Russian Strategic Arms Reduction Treaty that has replaced the old START I Treaty, which expired on December 5, 2009;
- begin negotiations to further reduce the nuclear weapons of the two leading powers and address attendant problems (long-range precision-guided conventional weapons, non-strategic nuclear systems, etc.);
- conclude an agreement on predictability in future U.S. missile defense programs (particularly in Europe), and pursue negotiations regarding a joint U.S.-Russian-European Union BMD system, based on the Russian proposals of 2007 and 2008 as one of the constituent elements;
- place the NFC facilities (or begin with the uranium enrichment plants) of the “nuclear five” (or, as a starting point, at least the “nuclear four”) states under IAEA safeguards, which could help to accelerate the negotia-

tions on the FMCT and the universalization of the 1997 Additional Protocol;

- launch negotiations on a Code of Conduct for activities in space, and subsequently on treaties to prevent a space weapons race;
- arrange consultations on a multilateral nuclear dialogue with the goal of including Britain, France, and China in the strategic arms reduction system and encouraging the adoption of a number of verification and confidence-building measures.

The sixth line of action for strengthening the NPT would involve the following: as a material incentive to member states for their loyalty to the NPT, projects need to be developed to provide guaranteed access to NFC shipments and services from multilateral NFC centers, as well as engaging these countries in programs dealing with the safe use of peaceful next-generation nuclear technologies and materials; the appeal of the Russian NFC initiative could increase substantially for many countries if aside from enrichment alone the Russian initiative were to also include such services as the production of fresh fuel and treatment of spent nuclear fuel.

Addressing the Iranian and North Korean nuclear problems will require a targeted approach and unity of purpose among the great powers in the UN Security Council. In exchange for their renunciation of nuclear weapons and critical nuclear technology, these countries should be provided with security guarantees and political and economic incentives, including the opportunity to develop a peaceful nuclear power industry.

The lines of action and measures listed above will in and of themselves significantly reduce terrorist access to nuclear weapons or materials; however, the great powers will also need to work cooperatively to directly suppress terrorist organizations.

The international documents that have already been adopted (in particular UN Security Council Resolution 1540 and the 2005 Convention for the Suppression of Acts of Nuclear Terrorism) should be applied more effectively. There is also a need for international programs that would introduce a common set of universal standards for physically securing, accounting for, and verifying nuclear materials on a global scale, addressed at the April 2010 Washington summit.

Cooperation Among the Great Powers

Over the Cold War years, the Soviet Union and the United States shared certain mutual interests and areas of cooperation, including the goal of nuclear weapon nonproliferation, from which the NPT eventually emerged. However, genuine and broad-scale cooperation between the superpowers was hindered by confrontation and global rivalry that undoubtedly subsumed any individual cooperative links.

After the end of the Cold War, the main barrier to mutual cooperation between the two countries had, in principle, disappeared. However, the growing political and military inequality between them, the distraction caused by new centers of power in the world, new regional candidates for leadership, and non-governmental players, and the appearance of a nuclear black market (all against the background of the negative aspects of globalization) created a fundamentally new series of problems for nonproliferation efforts. A Cold War level of cooperation will not be adequate to the resolution of these problems: both the new threats and the new opportunities demand a qualitatively higher level of cooperation comparable to (and in some areas even superseding) the relations that used to exist between the allies inside NATO or the Warsaw Pact (examples of such cooperation would be joint secret service operations, common missile defense systems, and cooperation on the Proliferation Security Initiative.)

There is no question that when it comes to nuclear proliferation, the attitudes of the great powers toward their regional allies and partners must necessarily differ from their attitudes toward their adversaries, since real international politics are concerned with many other important foreign and domestic issues aside from just proliferation. However, the great powers have had different sets of foreign partners and rivals, with the partners of one frequently being the adversaries of the other (and sometimes switching sides).

This situation can be corrected to some extent through a profound transformation of political and military relations between the great powers. In addition, the nonproliferation of WMDs and joint efforts to combat the threat of catastrophic terrorism should be given priority in the actual policies (not just declarations) of the leading powers. They should pursue these goals within the framework of the UN Security Council, the G-8, the Russia-NATO Council,

and other forums, as well as through reinforcement of nonproliferation mechanisms.

In particular, the approach a great power takes in specific instances of proliferation should not be based upon its relations with its regional neighbors, but just the opposite: the actual behavior of a particular problem state in this area should define the way the great powers relate to it. However, this principle must be applied on a reciprocal basis rather than selectively, following the current whims of each U.S. administration or the leadership in another great state. This will minimize the use of double standards and the deficit of unity that constitute the main obstacles toward achieving the highest priority international security objectives.

In and of themselves, measures aimed at universalizing the nonproliferation regime through "central" bilateral and multilateral nuclear disarmament measures, expanding the capabilities and authorities of the IAEA, specifying the provisions of the NPT, enhancing the export control system, and regulating and consolidating shipments of nuclear material and technology cannot guarantee a halt in nuclear proliferation, much less a roll-back. Such efforts are costly and complicated from the financial, political, organizational, and technical perspectives, and by no means are they always efficient in handling specific proliferation concerns. In this sense, they somewhat resemble a wide large-mesh seine net that may or may not catch the desired fish.

At the same time, an all-out shift to a targeted approach toward problem states and proliferation cases would be even more dubious, since such approaches are often subjective and based on double standards, and would be disruptive to unity and mutual trust among the great powers in the UN Security Council, the NPT member states, the Nuclear Suppliers Group, and the G8. This approach would lead to the disintegration of the nonproliferation regime and systems, and in the long run create far more problems than it would resolve for WMD proliferation and the rise of international terrorism, as plainly demonstrated by the Iraq saga of recent years.

There is little question that universalization and reinforcement of the NPT regime and its mechanisms must provide a framework for targeted approaches to individual problem countries and regions. Yet the reinforcement of this foundation would be an essential (though insufficient) condition for success. What is most important is that any such targeted actions, especially those involving the use of force,

should be legitimate and should represent unity of purpose and cooperation among the great powers and their regional partners.

NOTES

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CHAPTER 14

IAEA SAFEGUARDS

Roland Timerbaev

It has been half a century since international IAEA safeguards first began serving the cause of nuclear weapons nonproliferation. The first safeguards document (quite modest by today's standards and requirements), which established verification procedures for reactors having a heat-generating capacity of less than 100 MW (i.e., mostly research reactors), was developed in the late 1950s and approved by the Agency's Board of Governors in January 1961.¹

Since those days, the IAEA safeguards system has developed by leaps and bounds. To briefly review the main milestones on this long and at times tortuously difficult journey: in 1965, the safeguards were extended to include reactors of any capacity; between 1967 and 1968, irradiated nuclear fuel processing and nuclear fuel production facilities were included;² in 1972, a system of comprehensive NPT safeguards was developed;³ in 1997, the Additional Protocol to the Nuclear Safeguards Agreement was adopted, providing for the inspection of nuclear activities that had not been declared by the country;⁴ and in recent years, the Agency began implementing integrated safeguards that represented an optimal combination of all the measures available to the IAEA.

This progressive evolution of the safeguards system was possible largely due to the constructive cooperation that had developed between the two main nuclear powers of the world, the United States and the Soviet Union/Russian Federation.

The safeguards idea originated with some of the most respected nuclear scientists in the world: Niels Bohr, Leo Szilard, and Robert Oppenheimer. The safeguards principle had initially been included in the very first resolution ever issued by the UN General Assembly, which was unanimously adopted in January 1946.⁵ However, following the establishment of the IAEA in 1957, the Soviet Union initially remained unreceptive to efforts to develop this safeguards sys-

tem. Moreover, the all-powerful Ministry of Nuclear Energy (which was officially called the Ministry for Medium-Machine Building, or MinSredMash) even proposed working to get the Agency to “abandon the system of strict controls called for in the Statute,” i.e., in essence it was suggesting outright violation of the Statute. As an argument in favor of such an approach, they pointed to the danger of “turning the Agency into a tool of nuclear colonialism” (?!). The head of the Ministry of Foreign Affairs, Andrei Gromyko, succeeded in blocking the MinSredMash proposal, and after a while, our country became actively involved in the process of creating and subsequently improving the IAEA system of safeguards.⁶

The major powers have continued to cooperate in reinforcing the safeguards to the present day. The Agency’s safeguards system enjoys continuing broad support by the international community as a vital component of the international nuclear nonproliferation regime. The IAEA and its Director General were even awarded the Nobel Peace Prize in 2005, and in November 2009 the UN General Assembly unanimously adopted a resolution (co-authored by the Russian Federation, the United States, and a number of other countries) on the results of the IAEA’s Annual Report, in which it reaffirmed its “strong support for the indispensable role of the Agency in encouraging and assisting the development and practical application of atomic energy for peaceful uses, in technology transfer to developing countries *and in nuclear safety, verification and security.*” (author’s italics)⁷

The Development of Primary Safeguard Methods and Procedures

The safeguards system is based upon the IAEA Statute. Article II of the Statute states that the Agency “shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.” Article III.A.5 authorizes the Agency to “establish and administer safeguards designed to ensure that specific fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any

bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy."

The primary safeguard principles and methods are summarized in some detail in Article III. They include various types of monitoring and inspection mechanisms, all the way to granting international inspectors access within the borders of a nation at any time to any site as necessary for meeting the requirements of the safeguards. Moreover, if a case of violation of the safeguards agreement has been discovered, the Board of Governors may require the violating country to immediately correct the situation; otherwise, it shall report to the Security Council and the General Assembly for them to take the appropriate measures, including those stipulated in Article VII of the United Nations Charter. This last provision was included in the Charter at the suggestion of the Soviet Union.

In practice, safeguards under the IAEA Statute began to be applied primarily on the basis of bilateral and multilateral agreements between the Agency and nations supplying or receiving nuclear materials, equipment, or technology under the principles outlined in document INFCIRC/66/Rev.2 of 1965 through 1968. This safeguards document provided procedures for implementing controls over certain nuclear facilities, but not for nuclear activity as a whole. It is currently applied in nations that have not joined the NPT, but its main advantage rests in the fact that these controls will operate in perpetuity, unlike the NPT safeguards, which come to an end upon a nation's withdrawal from the Treaty, as was the case with North Korea.

Still, the NPT did establish the international legal standard of mandating the extension of IAEA safeguards to "all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or carried out under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices." Following the enactment of the Treaty, a special committee of the IAEA Board of Governors developed a model comprehensive safeguards agreement for non-nuclear member states of the NPT.⁸

The comprehensive safeguards system under the model safeguards agreement and in practice is based on the following primary principles and conditions:

- the intent of the safeguards is to prevent diversion of nuclear materials from peaceful nuclear activities to the manufac-

ture of nuclear weapons or other nuclear explosive devices. This requires that any diversion of significant quantities⁹ of nuclear material to produce nuclear weapons or other nuclear explosive devices be detected early;

- every state shall establish and maintain a national system of accounting and control over all nuclear material subject to safeguards;
- the state shall provide the Agency with an initial report on all nuclear material that should be subject to safeguards and the characteristics of the nuclear facilities involved in safeguarding this material;
- the Agency shall verify the completeness and correctness of the information contained in the country's report on its nuclear materials through inspection;
- in accordance with established criteria (nuclear material quantities and isotopic composition, the facility's "sensitivity" for nuclear proliferation, etc.), the international inspectors shall perform regular inspections of such facilities to verify the inventory amounts of nuclear materials and any changes in such amounts, which would include on-site measurement of the nuclear material and collection of samples for subsequent laboratory analysis at the Agency's headquarters;
- the Agency shall make broad use of such technical means for verification as special seals (for containment) and video cameras (for surveillance);
- the Agency may conduct special inspections if it has concluded that the information submitted by the nation was inadequate, and shall be granted access to any site having nuclear materials (no such special inspections have yet been carried out);
- the IAEA Director General shall report cases of violation of the safeguards agreement to the Board of Governors, which in turn, if necessary, shall report to the Security Council of the United Nations.

However, in implementing these comprehensive safeguards in practice a number of deficiencies were uncovered, primarily relating to undeclared nuclear activities. For one thing, more than 20 non-nuclear NPT member states have not concluded comprehensive safeguards agreements with the Agency (although, it is true, their nuclear ac-

tivities range from minimal to none at all); for another (and as noted above), these agreements, which are associated with NPT membership, would lose effect upon a nation's withdrawal from the Treaty.

In 1991, following the first Gulf War, it was determined that Iraq, an NPT member state with an IAEA safeguards agreement, had spent years pursuing secret nuclear weapons development. In accordance with a UN Security Council resolution, Iraq's entire capability in nuclear weapons and weapons of mass destruction was subsequently destroyed under the supervision of the United Nations Special Commission (UNSCOM) and the IAEA. The facts thus uncovered revealed that the IAEA safeguards system, which focused on declarations of nuclear material amounts and nuclear activities and provided only limited access to information and the nuclear facilities of Iraq, had been insufficiently reliable.

The new situation persuaded the international community to initiate a number of measures intended to reinforce the safeguards system. Between 1991 and 1993, the Agency took steps to strengthen the existing international safeguards system. The Board of Governors upheld the right to use special inspections, and adopted a decision requiring the timely submission of design information for facilities under construction or modernization, as well as broader accountability during import or export of nuclear materials and export of special equipment and non-nuclear materials.

In 1993, the Board of Governors approved the 93+2 Program, aimed at creating a system of safeguards that would operate more efficiently and still be as cost-effective as possible. During the development of this program, the following measures were confirmed as being necessary within the bounds of the Agency's current legal authority: require additional information from a country about those of its facilities where nuclear materials subject to safeguards have ever been or will ever be present; expand the use of unannounced inspections; conduct environmental sampling in areas of access; and make use of technically improved devices for remote monitoring of movements of nuclear material.

To strengthen the safeguards further would require new legal powers. In 1997, the Board of Governors approved the model Additional Protocol¹⁰ as the standard Additional Protocol for all future comprehensive safeguards agreements. The Board of Governors also proposed holding negotiations with states on joining the Additional Protocol to the Safeguards Agreement.

The Additional Protocol provides for the following measures:

- obtain information and inspector access to all aspects of the nation's nuclear fuel cycle (NFC), from its uranium mines to uranium waste storage facilities, along with any other nuclear material storage or handling locations;
- obtain information on locations of any nuclear fuel cycle research and development activities;
- obtain information on all of the buildings at each nuclear site and access to them by inspectors on short notice;
- obtain the nation's general plans for its nuclear fuel cycle activities (including any planned research and development activity) for the next 10-year period;
- obtain information on the manufacture or export of any sensitive nuclear-related technology;
- perform environmental sampling beyond the boundaries of sites declared by the state when deemed necessary by the IAEA; and
- implement administrative measures to improve the process of appointing inspectors, issuance of multiple-entry visas (needed for carrying out unannounced inspections), and IAEA access to modern means of communication.

On the whole, these measures have succeeded in fundamentally and qualitatively strengthening the international safeguards system. With regard to the nations that have joined the Additional Protocol, the Agency is now able to confirm not only that they have diverted no nuclear materials from peaceful use to use for producing nuclear weapons or other nuclear explosive devices, but also that they have no undeclared nuclear material and are not engaged in any undeclared nuclear activity of any kind. The Protocol allows on-site inspections at short notice; however, its biggest failing is that it is not a mandatory international legal standard, but is entered into by governments voluntarily, i.e., it relies upon the desire of a country, whether or not it is a participant in the NPT.

The Additional Protocol is in effect in 104 nations as of December 2010; however, there are still quite a number of other countries that remain outside of its sphere of action, including both nuclear and threshold nations such as Argentina, Brazil, Egypt, India, Israel, Mexico, North Korea, and Pakistan. Although Iran has signed the protocol, it has never ratified it. For several years, it observed its provisions voluntarily, but abandoned this effort in 2006.

In general, the situation with safeguard activities is described in the Annual Report that the Agency Secretariat publishes for the review and approval of the **Board of Governors**; the **Board** summarizes the results of its review as Safeguards Statements.¹¹ Such Statements usually contain rather cautious evaluations, such as in 2009, when the Agency Secretariat stated that in 52 countries it had “found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these states, all nuclear material remained in peaceful activities.” “For 37 of the states,” it continued, “the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities.” However, although “evaluations regarding the absence of undeclared nuclear material and activities for each of these states remained ongoing,” the Secretariat nonetheless came to the conclusion that “for these States, all nuclear material remained in peaceful activities.”

Regarding Iran, the Safeguards Statement for 2009 concluded that “Iran did not implement the requirements contained in the relevant resolutions of the Board of Governors and the United Nations Security Council, including implementation of the additional protocol. The implementation of these requirements is essential to building confidence in the exclusively peaceful purpose of Iran’s nuclear program and to resolving outstanding questions. In particular, Iran has not cooperated with the Agency in clarifying certain outstanding issues, which has given rise to concerns about a possible military dimension to Iran’s nuclear program. These issues relate to alleged studies on the green salt project, high explosives testing, and the design of a missile reentry vehicle; the circumstances of the acquisition of the ‘uranium metal’ document; procurement and research and development (R&D) activities of military related institutes and companies that could be nuclear related; and the production of nuclear equipment and components by companies belonging to the defense industries.”

Contrary to the relevant resolutions of the Board of Governors and the United Nations Security Council, Iran did not suspend its enrichment-related activities and continued with the operation of its Pilot Fuel Enrichment Plant and the construction and operation of the Fuel Enrichment Plant at Natanz. In September 2009, Iran informed the Agency that it had decided to construct an ad-

ditional enrichment facility, the Fordow Fuel Enrichment Plant. Subsequently, Iran announced its intention to build ten new enrichment plants.

Iran continued its work on heavy water related projects, again contrary to the relevant resolutions of the Board of Governors and the United Nations Security Council, including the construction of the IR-40 heavy water moderated research reactor at Arak and operation of a Heavy Water Production Plant.

Although for the year 2009 the Agency was able to conclude that in Iran, “all declared nuclear material remained in peaceful activities,” verification of the correctness and completeness of Iran’s declarations continued.

NPT member nations that have only minimal amounts of nuclear materials or none at all are expected to conclude the Comprehensive Safeguards Agreement together with the Small Quantities Protocol (SQP); so far, over 70 such agreements have been signed. Such protocols, however, do not provide the Agency with the means needed to obtain the necessary safeguards information or conduct the required verification checks. In particular, the Agency lacks the ability to obtain information from the countries at an early stage on their planned or existing facility designs. There are also no provisions for submission of initial reports on the amount of nuclear material used for peaceful activities within the borders of that country (or under its jurisdiction or control), and finally, these protocols make no allowances for inspections.¹²

In the meantime, as has recently become increasingly obvious, the amounts of nuclear material and numbers of facilities of various types in such countries have been increasing, which cannot but underscore the need for stronger safeguards. Not least among the reasons for amending the Small Quantities Protocol was the situation that developed with the nuclear activities of Saudi Arabia, which had dragged out the process of concluding the Comprehensive Safeguards Agreement and the Small Quantities Protocol for many years before doing so in 2005.¹³

That same year, the Board of Governors approved measures that would require nations with Small Quantities Protocols to submit initial nuclear material reports and timely information about the designs of their planned nuclear facilities so as to allow the necessary inspections to be conducted on-site. As a result of the administrative measures approved by the Board of Governors, the Agency was

able to initiate negotiations on SQP changes to strengthen the safeguards activities in the SQP States. In 2008, the necessary revisions were made to the SQP protocols with eight countries.

Due to the existence of various versions of the safeguards agreements and the Additional Protocol, the Agency initiated improvements to the entire safeguards system so as to integrate them in the interests of optimizing safeguard operations. These integrated safeguards were intended to help create the most effective mechanism possible for implementing the full effect of the strengthened safeguards system. Accordingly, new verification measures were integrated into existing procedures in such a way as to avoid unwarranted or excessive burdens on the nation and on the operators of its facilities on the one hand, and on the Agency itself on the other, considering the Additional Protocol procedures, and to achieve maximum effectiveness given the resources available.

The approach to applying these integrated safeguards is individually developed for each nation by considering the particular circumstances in the country, adapting the approaches described in the standard model of the integrated safeguards to suit individual installations, and developing a plan to gain access to the country's nuclear sites and other locations of nuclear materials.

In 2008, these integrated safeguards were being applied in 25 countries, including Australia, Austria, Bulgaria, Canada, the Czech Republic, Ecuador, Ghana, Greece, Hungary, Indonesia, Ireland, Japan, Latvia, Lithuania, Mali, Norway, Peru, Poland, Portugal, Romania, Slovenia, and Uzbekistan.¹⁴ It is important that Canada and Japan are included on this list, since they are countries with large-scale NFC capabilities. In January 2010, an agreement was reached to apply the integrated safeguards to all non-nuclear nations in the European Union.

Thus, the fact that, on the whole, the IAEA has a sufficiently broad foundation for providing safeguards and is continually working to improve them can be seen as a positive factor. It has concluded 237 safeguards agreements with 163 nations, and in 2008 it conducted 2,036 inspections. Its safeguards apply at 1,131 nuclear facilities; its annual safeguards budget approaches 96.4 million euros (more than a third of the Agency's total budget), with another 10.7 million euros in off-budget funds.¹⁵

Nevertheless, there continue to be many problems (most of which are not the fault of the Agency) with operating the kind of safe-

guards system that can fully meet the requirements of the international nuclear nonproliferation regime.

The Application of Safeguards in Iran, Syria, and North Korea

Iran. Aside from building a light water reactor in Bushehr with Russian assistance,¹⁶ Iran had already been pursuing an undeclared nuclear program for 18 years (as IAEA inspection missions had determined as early as 2003), aimed at converting natural uranium into uranium hexafluoride for subsequent enrichment.¹⁷ Since 1991, Iran had stopped reporting data to the IAEA on its imports of natural uranium. The IAEA Director General's report to the Board of Governors, reviewed in 2003, noted that Iran had failed to satisfy a number of provisions in the safeguards agreement and that its nuclear activities were "a matter of concern." The report appealed to Iran to conclude an Additional Protocol with the Agency, and the Board of Governors in a unanimously adopted resolution supported the Director General's appeal, as well as again encouraging Iran to refrain from loading its pilot enrichment plant with nuclear material "as a confidence-building measure."

These facts and subsequent statements by Iranian representatives made it abundantly clear that Iran was actively developing its infrastructure to support a full NFC. It nevertheless has still not been proven that the leadership in Iran has decided to pursue a full-scale nuclear program, although such a question must occur even to the most impartial of observers.

Although at the Agency's insistence Iran signed the Additional Protocol in 2003, it has not ratified it to the present day, although it has promised to operate as though the protocol were in fact in effect. However, as noted above, it reneged on that promise in 2006 and is currently not following the rules of the Protocol.

The Agency's Director General, who periodically reports to the Board of Governors on the implementation of its safeguards agreement and the provisions of the UN Security Council resolution, has noted that the current inspections have yet to answer all of the questions that have been raised.

As indicated in the Agency's Annual Report for 2008, the inspectors had been able to check Iran's declared nuclear material, but

after March 2007 Iran had stopped complying with the requirement to provide timely facility design information, with a number of issues remaining outstanding regarding a “possible military dimension to Iran’s nuclear program.” The report called attention to the failure of Iran to join the Additional Protocol, which left the Agency unable to convincingly establish that it had no undeclared nuclear material or activities. In contravention of the decisions of the UN Security Council, Iran has not suspended its enrichment-related activities and continues to operate its Fuel Enrichment Plant at Natanz and heavy water moderated research reactor at Arak.¹⁸

In its report of November 16, 2009,¹⁹ the Agency supported the conclusions in the Annual Report for 2008 and added the information that Iran had informed the Agency in September 2009 that construction on a new pilot enrichment facility had begun near the city of Qom to enrich uranium to five percent uranium-235, with commencement of operation planned for 2011. Agency inspectors conducted a check of this 3,000-centrifuge facility in late October 2009. Iran explained the decision to construct this additional site as being due to the “growing threat of a military strike against Iran.” According to the Agency, questions remain about the intended use of the new enrichment facility.

The Board of Governors reviewed this report on November 26-27, 2009. During its presentation, the Director General of the Agency reported that Iran had requested assistance in acquiring fuel for the Tehran Nuclear Research Center, which primarily produced radioactive isotopes for medical uses. The Agency then developed a draft agreement for delivery of low-enriched uranium to Russia for enrichment and to France for manufacturing into fuel under IAEA safeguards. Although this draft was approved by France, Russia, and the United States, Iran refused to agree to it.

Upon completing its review, the Board of Governors expressed serious concern about the construction of the uranium enrichment facility near Qom, and appealed to Tehran for it to confirm that “Iran has not taken a decision to construct... any other nuclear facility which has as yet not been declared to the Agency.” Noting that Iran’s delay in disclosing the construction of its uranium facility at Qom had reduced the level of confidence that there were no other nuclear facilities, the Board of Governors appealed for Iran to implement the UN Security Council resolutions and comply with the demands of the Board of Governors fully and without delay. The Board

of Governors also called on Iran to engage with the IAEA in resolving all outstanding issues about its nuclear program and to provide the Agency with full access to the information it requires. Iran was also urged to comply with its safeguards obligations and to ratify the Additional Protocol fully and without qualification.²⁰

However, in its subsequent report of February 18, 2010, the Agency once again indicated that Iran was avoiding the “due cooperation that would permit the Agency to confirm that all nuclear material in Iran is in peaceful use.” The report also indicated that Iran “needs to cooperate in clarifying outstanding issues which give rise to concerns about possible military dimensions to Iran’s nuclear program...” However, it cited no specific facts on the matter.²¹ At the Board meeting in December 2010 the Director General stated that the Agency continued to verify the non-diversion of declared nuclear material in Iran, “but Iran has not provided the necessary cooperation to permit the Agency to confirm that all nuclear material in Iran is in peaceful activities. Iran is not implementing the requirements contained in the relevant resolutions of the Board of Governors and the Security Council, including implementation of the Additional Protocol, which are essential to building confidence in the exclusively peaceful nature of Iran’s nuclear program. In particular, the Agency needs Iran’s cooperation in clarifying outstanding issues which give rise to concerns about possible military dimensions to its nuclear program, including by providing access to all sites, equipment, persons, and documents requested by the Agency.”

Syria. In September 2007, the Israeli Air Force destroyed Syria’s Al Kibar facility at Dair Alzour; in May 2008, the Agency received information that this in fact had been a nuclear reactor under construction. Subsequent inspection of the site confirmed the presence of uranium particles that had not been among the nuclear materials that Syria had declared in its inventory. An Agency analysis showed that these uranium particles had been produced by chemical reprocessing. For their part, the Syrian authorities have insisted that Dair Alzour had been only a military facility, not a nuclear one. According to the Agency’s report to the Board of Governors of November 16, 2009, its attempts to secure Syrian cooperation in identifying the origin of the uranium particles had not been successful.²² In a statement during a Board of Governors meeting on March 1, 2010, General Director Amano noted once again that Syria was still not cooperating with the Agency in resolving outstanding issues.

Again on December 2, 2010, the Director General informed the Board that “Syria had not cooperated with the Agency since June 2008 in connection with the unresolved issues related to the Dair Alzour site and some other locations. As a consequence, the Agency has not been able to make progress toward resolving the outstanding issues related to those sites.”

North Korea. Agency verification activities in North Korea were suspended at North Korea’s insistence at the end of 2002. In early 2003, Pyongyang announced that it was withdrawing from the NPT and consequently terminating the comprehensive safeguards agreement.

Later, however, as a result of an understanding reached at the new round of Six-Party Talks with North Korea, in 2007 the Agency was able to inspect the condition of four installations at Yongbyon, including a chemical reprocessing installation and one installation at Taechon; however, in September 2008, the North Korean authorities informed the inspectors that they would no longer have access to the chemical reprocessing plant. North Korea alternated between closing and opening its Yongbyon facilities to inspectors throughout 2008; in April 2009, it demanded that all IAEA inspectors depart from North Korea and announced the resumption of operations at all of its nuclear facilities.²³ In May of the same year, North Korea announced its second nuclear test.

The Director General of the IAEA expressed concern about North Korea’s nuclear test at the June 15, 2009, meeting of the Board of Governors. No verification operations of any kind are being carried out in North Korea any longer. In a statement before the meeting of the Board of Governors on March 1, 2010, Director General Amano appealed for a resumption of the Six-Party Talks on the North Korean problem.

At the December 2, 2010, Board meeting the Director General stated that “it was with great concern that I learned of recent reports about a new uranium enrichment facility, as well as the construction of a light water reactor, in the DPRK.” He expressed his regret that the Agency had not had inspectors in North Korea since April 2009, and that North Korea had not permitted the Agency to implement safeguards in the country since December 2002.

India. The IAEA safeguards system in India is a special case in the history and practice of IAEA inspection activities. The international legal basis for nuclear export controls is Article 3.2

of the NPT prohibiting all Treaty member states from providing nuclear materials or the corresponding equipment to **any** non-nuclear-weapon state unless the materials or equipment are under IAEA safeguards. The implication is that such obligation would also apply to countries that are not members of the NPT (such as India). The Nuclear Suppliers Group (NSG) has adopted the principle of full-scope (or comprehensive) safeguards, meaning that a country would have to place all of its nuclear activities under safeguard before it would be able to obtain any nuclear materials or associated equipment and technology.

Nevertheless, in July 2005, the U.S. administration, obviously pursuing its own geostrategic interests,²⁴ reached an agreement under which India would receive exports of nuclear technology and equipment in exchange for certain promises concerning its nuclear program, in particular that it separate its civil nuclear activities from those of the military sector and place its civil nuclear activities under IAEA safeguards, including the provisions of the Additional Protocol. Thus, the two countries approached the issue of receiving nuclear exports as a “special case.”

In principle, the idea of inducing such NPT non-members as India, Israel, and Pakistan to join in the nuclear nonproliferation regime would unquestionably be worthy of attention, and its time has long come. However, any such decision must meet the ultimate objective of strengthening the regime overall and pursuing its steady and progressive universalization.²⁵

Nevertheless, under pressure from the United States, the Nuclear Suppliers Group (with the consent of Russia and the other parties to the NSG) decided to grant India special status under the export control system, and on the basis of this exception the Board of Governors approved a safeguards agreement with India. As early as 1971 through 1994, the Agency had already concluded safeguards agreements with India covering six reactors. Under the new agreement, safeguards were placed on eight other reactors that were already existing or under construction, although eight other reactors will remain uninspected. Although India has signed the Additional Protocol to the Nuclear Safeguards Agreement, it has yet to ratify it.

Further Reinforcement of the IAEA Safeguards System

With nuclear energy being more and more deeply entrenched in every aspect of society and nuclear technology continually improving, as well as constant challenges and threats to the NPT regime as a whole (including the threat of nuclear terrorism), the world community is faced with the challenge of reinforcing the system of international safeguards in order to prevent diversion of nuclear energy from civil to military use. Under such conditions, the IAEA, the main nuclear nations, and the international community as a whole must work tirelessly to steadily improve the effectiveness of safeguards and to ensure that they will be equal to the challenges that life and nuclear technology development continue to raise.

The Agency has been making serious efforts to develop and enhance the technical aspects of its safeguards. As indicated in its Annual Report for 2008, methods and equipment for the Agency's safeguards and sample analysis procedures have been modernized, and the use of remote monitoring and other procedures has been expanded.²⁶ The Agency has received considerable assistance on this score from the United States, the Russian Federation, and a number of other industrially developed nations.

However, the Agency would achieve much more if it fully possessed the resources required for safeguards activity. As former Director General of the IAEA Mohamed ElBaradei told a session of the UN General Assembly during his presentation of the Agency's Annual Report on November 2, 2009, "Our ability to detect possible clandestine nuclear material and activities depends on the extent to which we are given the necessary legal authority, technology and resources. Regrettably, we face continuing major shortcomings in all three areas, which, if not addressed, could put the entire nonproliferation regime at risk. In over 90 states, the Agency either has no verification authority at all, or its authority is inadequate, because these countries have not concluded the necessary agreements with the Agency. That means we often cannot verify whether a country is engaged in clandestine nuclear activities." "Our credibility depends on our independence," he added. "Additional funding is urgently needed for state-of-the-art technology so that, for example, we can independently validate environmental sampling analyses."²⁷ We also

need improved and consistent access to top-quality satellite imagery. Continuing with budgets that fall far short of our essential verification needs in the coming years is not a viable option.”²⁸

Yukiya Amano, the Agency’s new Director General, assumed his duties on December 1, 2009, and in his first statement on December 9 essentially repeated the above assessment of the situation with safeguards and expressed the same wishes regarding measures to reinforce the safeguards system.²⁹

A number of useful proposals were offered on this score in the report “Reinforcing the Global Nuclear Order for Peace and Prosperity: The Role of the IAEA to 2020 and Beyond,” produced in May 2008 by a group of renowned experts chaired by former President of Mexico Ernesto Zedillo,³⁰ and in a second report, “Eliminating Nuclear Threats. A Practical Agenda for Global Policymakers,” prepared in December 2009 by an independent international commission chaired by Gareth Evans and Yoriko Kawaguchi.³¹

In light of what has been presented above, what measures should be undertaken to enhance the effectiveness of the international nuclear nonproliferation regime?

1. The most important and immediate task would be for all nations engaged in significant or minor nuclear activity to join the Additional Protocol to the 1997 Nuclear Safeguards Agreement. The current state of affairs, where over the 13 years that the Protocol has been in existence only slightly more than one hundred nations have agreed to observe it (when there are over 180 nations that are members of the NPT), can by no means be considered acceptable. The two main nuclear-weapon powers, Russia and the United States, have set a good example by joining. The Additional Protocol must become a universal standard for verifying national compliance with nuclear nonproliferation obligations.

UN Security Council Resolution 1887, approved on September 24, 2009, by heads of states and governments, unfortunately contains only an appeal to nations to join the Additional Protocol voluntarily. This is clearly not enough. The Security Council should act on its authority under Article VII of the Charter of the United Nations and adopt a decision *requiring* states that have not yet signed or ratified the document to do so.

2. The International Atomic Energy Agency should continue to actively work toward implementation of the so-called integrated safeguards for safeguards activities in the greatest possible number

of countries that have concluded comprehensive safeguards agreements with the Agency and have joined the Additional Protocol, which will help to improve the effectiveness of the safeguards while simultaneously ensuring greater cost-efficiency.

3. Considering the fact that a number of countries in recent years have expressed increasing interest in the acquisition of uranium enrichment technology (with the attendant threat of nuclear proliferation), the idea of creating multilateral nuclear fuel cycle centers under IAEA safeguards (such as the one being set up in Angarsk, Russia) should be actively pursued in the future, as well as a nuclear fuel bank (or banks) for nuclear power plants, with the Agency acting as guarantor for the supply of such fuel to the nations that require it.

In 2009, at Russia's suggestion, the IAEA Board of Governors considered the issue of creating a sufficient physical reserve of low-enriched uranium in Angarsk to manufacture enough fuel for two full loads for the most common type of reactor, the 1000 MW pressurized water reactor (PWR): 120 tons of uranium hexafluoride enriched to two- to five-percent uranium-235. Russia would bear all costs of production, storage, and maintenance of the fuel reserve. Decisions to supply LEU to member states would be made by the IAEA Director General, thus ensuring the independent, transparent, and politically unprejudiced nature of decisions to allocate fuel out of the safeguarded reserve. The Board of Governors adopted a resolution in which it welcomed the Russian Federation's proposal and authorized the Director General to conclude and subsequently implement the corresponding agreement with the Russian Federation.³²

4. Considering the reasonable desire of the IAEA leadership to obtain additional funding, the possibility must be explored of increasing the safeguards budget to enable the Agency to acquire the first-class analytical equipment and other technology it needs to meet its safeguards obligations in a qualified and independent manner.

The Agency should have its own research and development base for the safeguards so as to not be dependent upon the owners of the technology and have an ability to conduct remote monitoring and at the level of experts and politicians to analyze the merits of transforming the current safeguards approach (which is basically criteria-driven) into an approach that relies on analysis of information obtained from open sources or other available sources (information-driven safeguards).

At the same time, it would be wrong to steer the Agency toward taking an approach to information analysis that would be more appropriate for intelligence operations than for international intergovernmental organizations. There should be a reasonable balance between analytical information analysis and criteria-based confidence that any meaningful quantities of nuclear materials from declared facilities or sites outside of the safeguards will be discovered.

5. In recent years, steps have been taken to convert some research reactors to operate on lower-enriched uranium fuel and return the highly-enriched uranium and spent fuel to the countries that initially provided such reactors (in particular, Russia).³³ Over 100 research reactors, however, continue to use uranium enriched to 90 percent or more. These measures should continue to be energetically pursued.

6. Implementation should be accelerated of UN Security Council Resolution 1540 (2004), which aims to establish more effective measures against the threat of nuclear and other types of weapons of mass destruction, their component parts, and means of delivery falling into the hands of non-state entities, primarily terrorists.

7. It would also be advisable for the UN Security Council to develop a set of measures in coordination with the IAEA that would be mandatory for all nations and serve as a guide for the consequences of withdrawal from the Nuclear Non-Proliferation Treaty, and that would also define steps that the Security Council could take to discourage future departures from the NPT under Article X.1, or at least to minimize the negative impact (in particular, by ensuring the indefinite continuation of the safeguards over nuclear activities that had been ongoing when the party had been a member of the NPT).

8. Governments and international organizations such as the United Nations and the IAEA can and must take the lead in promoting the universal development of a WMD nonproliferation culture and mentality and in monitoring its implementation, underscoring the unacceptability of nuclear weapons to human society and conducting educational programs on nuclear nonproliferation and disarmament. Also of great importance are the activities of the nongovernmental organizations (NGOs) in a number of countries, which, hopefully, will continue to develop in the future. In Russia, these would include the following: The Russian Center for Policy Studies (PIR Center); the International Security Center of the Institute of World Economy and International Relations (IMEMO) of the Russian

Academy of Sciences; the Carnegie Moscow Center; the Center for Arms Control, Energy and Environmental Studies of the Moscow Institute of Physics and Technology (MFTI); the Center for Energy and Security Studies; and others. Although based in Moscow, these NGOs also engage other young experts and students from various parts of Russia, as well as from different countries. It would be useful if such NGOs were to develop in the various regions of Russia, as well.

IAEA Safeguards For Verifying Nuclear Disarmament Measures

The many years of generally productive experience with IAEA safeguard activities may allow them to be used to address broader issues, related not only to preventing nuclear proliferation, but also to halting the production of weapons-grade materials and weapons, and possibly to implementing far-reaching measures to expedite the advance toward a world free of nuclear weapons.

An important precedent was established in this regard in 1993 while the IAEA was verifying that South Africa had indeed renounced its military nuclear program, a decision that received the unanimous approval of all of the members of the Agency. In order to verify the absence of nuclear weapons in the country, the IAEA enlisted the help of nuclear weapons experts from the main nuclear states.

Between 1996 and 2002, a trilateral initiative was developed between Russia, the United States, and the IAEA regarding the verification of nuclear materials that they had declared surplus. By November 2001, Russia and the United States were on the verge of reaching a model verification agreement that would have included the use of the so-called information barriers to preclude any disclosures of sensitive information. However, the talks were broken off by both governments when the George Bush administration announced its disagreement with the 13 practical disarmament measures approved at the 2000 NPT Review Conference, which included support for the trilateral initiative. Russia also refused to pursue the initiative any further.³⁴ Nevertheless, the two countries officially pronounced the initiative a success in 2002, and now it remains to be applied at the level of individual agreements.

The IAEA's experience in safeguarding may also be in great de-

mand in reaching agreement on prohibiting the production of fissile materials by both the nuclear powers and all of the other nations involved in uranium enrichment, spent nuclear fuel reprocessing, and plutonium separation. It would seem to be obvious that to verify such an agreement, the existing system of IAEA safeguards would need to be strengthened and equipped with the necessary methods and procedures that fully measure up to its new tasks. The Agency, however, already has the key fundamentals to perform such work, and, importantly, it also has the experience of many years behind it.

However, it would only make sense to conclude a full-fledged Fissile Material Cut-off Treaty if it were joined by all of the nuclear states (regardless of whether or not they are member nations of the NPT) and by all other nations, especially if they have nuclear technology and the corresponding industrial capabilities. Obviously, the initial draft agreement should be negotiated by a relatively narrow but representative group of key nations (rather than at such broad and often difficult to manage forums as the World Disarmament Conference), and then presented for broader consideration. Russia and the United States, as the two states with the greatest numbers of weapons-grade fissile materials, could and should assume the lead in this process. This would not only help to effectively strengthen the international nuclear nonproliferation regime, but would also advance the cause of the total elimination of the nuclear threat.

NOTES

- 1 IAEA document INFCIRC/26.
- 2 Document INFCIRC/66/Rev.2.
- 3 Document INFCIRC/153.
- 4 Document INFCIRC/540.
- 5 UN General Assembly, *Resolution No. 1*, Jan. 24, 1946.
- 6 For more details see: R.M. Timerbaev, *Russia and Nuclear Nonproliferation* (Moscow: Nauka, 1999), PP. 187-208.
- 7 UN General Assembly, *Resolution A/RES/64/8*, Nov. 2, 2009.
- 8 Document INFCIRC/153.
- 9 "Significant quantity" is understood as eight kilograms of weapons-grade plutonium and 25 kilograms of highly-enriched uranium (uranium-235 content above 20 percent).
- 10 Document INFCIRC/540.

- 11 The actual safeguarding report has never been published. However, the Safeguards Statements can be found at the website of the IAEA: <http://www.iaea.org>.
- 12 IAEA document GOV/2005/33.
- 13 Based on media reports, Saudi Arabia has a nuclear energy research institute, an energy project laboratory, a 3 MW particle accelerator, a hot laboratory, and other facilities and sufficiently qualified specialists. With today's black market for nuclear materials and technology and the country's enormous wealth, Saudi Arabia is now capable of quickly implementing a wide-scale nuclear program. (Yana Feldman and Mary Beth Nikitin, "Verifying Small Quantities: Saudi Arabia's SQP," *Trust & Verify*, no. 121 [July-September 2005]: PP. 5-7; Charles Mahaffey and Yana Feldman, "Saudi Arabia's National Security: What Role Could WMD Play?," *Nuclear Control*, 9, no. 3-4 [2004]: PP. 65-75).
- 14 IAEA, *Annual Report 2008* (2009), P. 79.
- 15 *Ibid.*, PP. v, 100
- 16 According to the Russian media, on Nov. 16, 2009, Russian Minister of Energy Sergei Shmatko announced that the Bushehr nuclear power plant would not be launched on schedule "for technical reasons."
- 17 IAEA document GOV/2003/40.
- 18 IAEA, *Annual Report 2008*, P. 80.
- 19 Document GOV/2009/74.
- 20 Document GOV/2009/82.
- 21 Document GOV/2010/10.
- 22 Document GOV/2009/75.
- 23 Document GOV/2009/45-GC(53)13.
- 24 Renowned U.S. weapons nonproliferation and limitation experts Fred McGoldrick, Harold Bengelsdorf and Lawrence Scheinman believe that the U.S.-India agreement "was clearly motivated by and reflects the mutual interests of both states in counterbalancing the rise of Chinese power." (Fred McGoldrick, Harold Bengelsdorf, and Lawrence Scheinman, "The U.S.-India Nuclear Deal: Taking Stock," *Arms Control Today*, 35, no. 8 [October 2005]: PP. 6-12.)
- 25 The search for a universally acceptable solution to the "third-party nation" problem that would strengthen rather than weaken the nonproliferation regime has been advocated by such U.S. experts as Ambassador Thomas Graham, who served as President Bill Clinton's special representative for arms control, nonproliferation and disarmament, and Avner Cohen, the Israeli author of *Israel and the Bomb*, who now works in the United

- States. The author of the present chapter shares this opinion, as he has already written in the *IAEA Bulletin*. (Roland Timerbaev, "What Next for the NPT? Facing the Moment of Truth," *IAEA Bulletin*, 46, no. 2 [March 2005]: PP. 4-7.)
- 26 IAEA, *Annual Report 2008*, PP. 82-86.
- 27 Currently, the Agency occasionally has to send its samples to the national laboratories of countries having more modern equipment (author's note).
- 28 Statement by the IAEA director general in the UN General Assembly on Nov. 2, 2009, <http://www.iaea.org/newscenter/statements/2009/eb-sp2009n017.html>.
- 29 Director general's remarks, Dec. 9, 2009, <http://www.iaea.org/newscenter/statements/2009/amsp2009n023.html>.
- 30 *Reinforcing the Global Nuclear Order for Peace and Prosperity: The Role of the IAEA to 2020 and Beyond*, May 2008.
- 31 *Eliminating Nuclear Threats. A Practical Agenda for Global Policymakers*, December 2009.
- 32 Document GOV/2009/81.
- 33 Global Threat Reduction Initiative (GTRI).
- 34 Thomas E. Shea, "The Trilateral Initiative: a Model for the Future?," *Arms Control Today* (May 2008).

CHAPTER 15

NPT: THE RIGHT TO WITHDRAW

Alexei Arbatov

Article X.1 of the Treaty on the Non-Proliferation of Nuclear Weapons reads as follows: “Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.”¹ Unexpectedly for its creators, however, after two decades this Article has become a real problem for maintaining the Treaty and implementing all non-proliferation regimes.

After the Treaty came into effect in 1970, the main task of strengthening the nonproliferation regime became to do everything possible to expand the list of Treaty member states and improve the effectiveness of IAEA safeguards and of the system of export controls over nuclear materials and technologies. Once the Treaty had become nearly universal following the mass influx of new countries in the 1990s, however, the center of attention shifted to the issue of withdrawal from the Treaty. The four countries that are currently not covered by the Treaty (India, Israel, North Korea, and Pakistan) are all nuclear states, so any risk of further nuclear weapons proliferation would only arise through the development of such weapons in secret in violation of the Treaty and/or if one of the current non-nuclear states should withdraw from the Treaty and openly turn to the acquisition of nuclear weapons.²

It is true that North Korea had apparently been carrying out secret activities in violation of the NPT even before it openly withdrew from the Treaty, and that Iran has also been suspected of past actions that violated the terms of the IAEA safeguards.³ Even with no

violations of the Treaty at all, however, other states still theoretically have the right to openly and legally withdraw from the Treaty after giving the three-month notice stipulated in Article X.1, having acquired the nuclear material, technology, and experts over time under and through it.

This risk has been further compounded as the non-nuclear states have developed components of the nuclear fuel cycle, in particular the capabilities of enriching natural uranium (especially if it is mined in the particular country) and reprocessing spent nuclear fuel to recover its plutonium.⁴ Such technologies can allow a state to reduce substantially the amount of time it takes to accumulate enough weapons-grade nuclear material to produce a number of nuclear devices after withdrawing from the NPT.

The Right to Withdraw

The right to withdraw from the NPT (as is true for any treaty, in particular those dealing with disarmament issues) is an integral element of the national sovereignty of all of the Treaty participants. Any attempt to curtail this right (such as in the mid-1980s, when the Soviet Union proposed concluding an agreement with the United States on setting a timeframe within which they would agree not to exercise their right to withdraw from the ABM Treaty) would be legally absurd and politically unacceptable. After all, the grounds for a state to withdraw from agreements of this sort are “threats to its supreme interests,” thus, to demand that a state waive its right to withdraw even in the case of a threat of this magnitude would be preposterous. Moreover, any effort to block a state’s right to withdraw in contradiction to the provisions in the NPT could actually have an opposite effect: its disintegration. Since each country when joining the Treaty had accepted its provisions in their entirety, including Article X.1 on the right to withdraw, any attempt to redo any single key provision retroactively could “dump” the whole bundle of articles.

Nevertheless, withdrawal from the NPT must not become a routine, formal, or fully arbitrary action. As explained in Article X.1, withdrawal is to be preconditioned upon serious circumstances, the justification of which is not to be a matter of mere legal formality but logically entails a set of procedures. Given the logically indisputable nature of the spirit of the NPT, most experts

in the world are currently in agreement regarding several important assumptions.⁵

First, no state should be allowed to use the Treaty in order to gain the benefits of international cooperation in the sphere of the “peaceful atom” and then withdraw from the NPT to use these benefits for military purposes. Such a potential would turn the Treaty against itself.

Second, no state must be allowed to withdraw from the Treaty in order to conceal previous NPT violations it may have committed while a member of the Treaty.

Third, the grounds for withdrawal must in no case be treated as a mere formality; they must fully satisfy the spirit and letter of the Treaty and be a criterion against which the true reasons and intentions behind a country’s withdrawal from the NPT may be evaluated (as well as adequate counter-measures to be taken by the global community).

Fourth, review of whether such grounds satisfy Article X.1 must be conducted by the remaining NPT member states and the UN Security Council, rather than by a single state or group of states acting on their own.

Fifth, rendering of judgments on Treaty violations must remain the exclusive prerogative of the IAEA, not any individual state (which would also apply to additional checking of possible past violations by a state that has announced an intention to withdraw from the Treaty).

Sixth, evaluation of the validity of a country’s motives for withdrawing from the NPT and whether to apply sanctions or military force (in case of unjustified withdrawals or IAEA discovery of past Treaty violations) remains under the exclusive jurisdiction of the UN Security Council. It was no coincidence that the UN Security Council member states decided in 1992 that the proliferation of WMDs would constitute a “threat to international peace and security within the meaning of the UN Charter,”⁶ in other words, would fall under Articles 41 and 42.

The cases of Iran and North Korea demonstrate violations of nearly every one of the fundamental considerations described above. This is unquestionably the main reason for the very prolonged and still deadlocked international security crises surrounding the Korean and Iranian problems. However, they are also providing a rich case history for drawing lessons for the future in preventing nuclear proliferation by other states.

Grounds For Withdrawal and Notification Period

As is known, North Korea joined the NPT in 1985 under persistent pressure by the Soviet Union, which hoped to open the way for cooperation between the two countries in the peaceful use of nuclear energy in accordance with Article IV of the NPT. Pyongyang, however, did not sign the IAEA safeguards agreement (which was supposed to be signed within 18 months) until five years later, in 1992. This itself was a flagrant violation of Article III.4 of the Treaty and should have been the subject of serious investigation by the IAEA or the UN Security Council.

Once North Korea had signed the IAEA agreement, the first inspections revealed serious discrepancies between the information Pyongyang had submitted and the facts that the Agency actually found on site. To resolve the discrepancies, IAEA inspectors were authorized to conduct a “special inspection” above and beyond the list of facilities Pyongyang had declared (storage facilities for the radioactive waste from the Yongbyon reactor), but Pyongyang refused to allow this. Subsequently, in 1993, North Korea announced its decision to withdraw from the Treaty, using two factors to justify its decision: the Team Spirit military training exercises that the United States had conducted with South Korea, and a “lack of impartiality” among the Agency inspectors requesting special inspection rights.⁷ Such grounds for withdrawal did not meet the requirements of Article X.1 in any way: neither the military exercises (which had already been conducted regularly in the past) nor the alleged prejudice of the inspectors rose to the level of “extraordinary events” that “jeopardized the supreme interests” of North Korea, which were the only acceptable grounds for withdrawal. Accordingly, North Korea had needed to renounce the Treaty in order to conceal past violations committed while the country had already been party to the NPT, which should have drawn an appropriate response from the UN Security Council. However, the supreme international institution failed to act, despite unprecedented unity of its members in the early 1990s following the end of the Cold War. China was prepared to veto the U.S.-sponsored sanctions resolution, forcing the Security Council to merely appeal to North Korea to allow a special inspection, which Pyongyang promptly refused.

In place of the Security Council, the Democratic administration in Washington began discussing possible sanctions or military force against North Korea, but these measures were not undertaken, inasmuch as during a visit to North Korea former U.S. President Jimmy Carter convinced the North Korean leader Kim Il-sung to agree to cancel the withdrawal from the NPT. In exchange, Japan, South Korea, and the United States offered a package that later served as the basis for the Agreed Framework and the Korean Peninsula Energy Development Organization (KEDO) project in 1994. The day before the three-month notice stipulated by Article X.1 was to end, Pyongyang canceled its decision to withdraw from the Treaty. The nuclear facilities in North Korea were placed under IAEA safeguards and their activities were frozen. In the euphoria resulting from the agreement, no investigation was undertaken into the alleged NPT violations by North Korea between 1985 and 1992, which left the lack of a justification for the 1993 North Korean withdrawal from the Treaty without any legal or political consequences.

The next time North Korea withdrew from the NPT was during the Republican administration of George W. Bush, which had taken a rigid stance against North Korea, calling it part of the “axis of evil” and condemning the preceding administration’s policy of engagement with “rogue states.” The rigidity of the administration’s position escalated to unprecedented levels in the aftermath of the catastrophic terrorist acts of September 11, 2001. Pyongyang’s decision to withdraw from the NPT was made against a backdrop of the then successful use of allied forces against Al Qaeda and the Taliban in Afghanistan, the run-up to the military invasion of Iraq, and the entirely plausible threats of such force being used against Iran and North Korea.

It is well known that the reason for this was the accusation in October 2002 by the United States that North Korea was allegedly engaging in a secret uranium enrichment program outside the IAEA safeguards. According to the U.S. version, North Korean officials had admitted the existence of this program (which the Koreans denied), after which the United States then halted its deliveries of fuel for North Korea’s heating plants that had been provided under the 1994 Agreed Framework. Following unsuccessful negotiations in January 2003, Pyongyang notified the UN Security Council of its intention to withdraw from the NPT due to the “grave situation where our state’s supreme interests are most seriously threatened.”⁸ At the same time, citing its 1993 notification (which it had with-

drawn the day before the three-month period stipulated in Article X.1 was to expire), North Korea announced that its withdrawal would come into effect the next day, i.e., immediately.⁹

This was clearly a flagrant violation of the NPT, since the grounds for withdrawal in 1993, which had been unconvincing even then, could hardly be considered relevant ten years later. Both the motive cited and the period of notice contradicted the letter of the NPT, a fact that could have been the reason for the UN Security Council to decide to impose sanctions. Russia and China, however, did not support sanctions, preferring to continue with negotiations. Six-Party talks began soon thereafter, but did not bring any result. Then, on October 9, 2006, North Korea conducted a nuclear test and became the world's ninth nuclear state.

Strong-arm pressure and violation of the 1993 agreement by the United States apparently increased Pyongyang's incentive to create nuclear weapons and provided it with the excuse to withdraw from the NPT. Moreover, the withdrawal of the United States from the ABM Treaty in 2002 and its refusal to ratify the CTBT only boosted North Korea's hand in withdrawing from the NPT and conducting subsequent nuclear tests.¹⁰ In addition, however, a highly negative role was played by the absence of unity among the members of the UN Security Council and the disregard of North Korea's flaunting of the provisions of Article X.1 on withdrawal from the Treaty exhibited by the member states of the NPT and the UN Security Council.

Unlike the North Korean nuclear saga, the Iranian nuclear program and its associated policies are at an earlier stage of development. Tehran continues to insist on the entirely peaceful nature of its nuclear program and professes its adherence to the NPT, yet the symptoms of future cataclysms are already evident. Between 2005 and 2006, for example, Iran followed the Korean paradigm by issuing repeated warnings that if the "Iran case" were passed from the IAEA to the UN Security Council, Iran would stop observing the 1997 Additional Protocol, which it had signed but never ratified; this is exactly what happened. Then Tehran threatened that if any sanctions were imposed by the UN Security Council, it would respond by halting its cooperation with the IAEA or even withdrawing from the NPT.

Still, consideration of the issue by the UN Security Council or even implementation of sanctions could hardly be seen as grounds for with-

drawal from the NPT based upon the wording of Article X.1 (extraordinary events, related to the subject matter of this Treaty that have jeopardized the supreme interests of its country). The great powers, however, reacted in no decisive way to these threats.

Once again, due to the disunity among the great powers in the UN Security Council, compliance with IAEA safeguards and membership in the Treaty itself became Iranian tools to blackmail and obtain political concessions from the other states as was the case with North Korea. Rather than a document that would restrict national nuclear policies, the NPT and its mechanisms are becoming a channel for reverse pressure by states violating (or potentially violating) it against the IAEA and UN Security Council in their efforts to preserve the NPT.

The issue of the grounds for withdrawal from the NPT was discussed during the NPT Review Conference in 2005. Many of the participants, including Russia and the Western states, favored a stricter approach in evaluating whether the declared grounds correspond to the spirit and letter of Article X.1. Curiously, however, the United States insisted to the contrary on the “sovereign right” of a state to withdraw for any reason.¹¹ Obviously, in so doing the United States was seeking to deflect any criticism from itself for its renunciation of the ABM Treaty in 2002.

Withdrawal From the NPT to Conceal Violations

Pyongyang’s step toward withdrawal in 1993 was probably directly connected to its efforts to conceal past IAEA safeguards violations. However, North Korea’s withdrawal was cancelled one day before the three-month notification period was to expire, and this did not receive due assessment by either the member states or the UN Security Council. North Korea’s second and final withdrawal from the NPT in 2003 could hardly be as unequivocally linked to the concealment of Treaty violations, (although it was indeed conducting a secret uranium program).

Tehran’s 2005 decision to stop abiding by the 1997 Additional Protocol after the “Iranian dossier” had been submitted to the UN Security Council, and its threat to withdraw from the NPT in the event of sanctions imposed against it evoked serious suspicions that it was thereby attempting to hide past Treaty violations.

Still, its non-compliance with the Additional Protocol represents a more dangerous step than its resumed uranium enrichment activities, even if this Protocol has never been ratified. The threats from Iran should have been reason enough for the IAEA and the Security Council to harden their position; however, their attention was focused on halting enrichment (which is allowed under the NPT) rather than enforcing the Additional Protocol.

In 2004, the UN Secretary General's High Level Panel on Threats, Challenges and Change (composed of 12 authoritative former senior state officials) proposed that the UN Security Council hold the states withdrawing from the NPT responsible for any violations they may have committed while still members of the Treaty. The Panel concluded that once a state announced an intention to withdraw from the NPT, it was to immediately be checked for past compliance with the Treaty, with the sanction of the UN Security Council, if necessary. A year later, at the NPT Review Conference of 2005, essentially the same proposals were presented by the United States, the European Union, Japan, Australia, and New Zealand.¹² Russia's position was vaguer: on the one hand it favored holding states more accountable if they decided to withdraw under Article X and coordinating a number of political procedures and measures; on the other, however, it was opposed to reconsidering the provisions of the Treaty.¹³

Military Use of the "Peaceful Atom"

Various measures have been proposed for preventing such activity. At the 2005 NPT Review Conference, for example, the European Union and a number of other countries proposed working out a rule under which even a state that has withdrawn from the NPT would be required to continue using exclusively for peaceful purposes all materials and technology that had been created for peaceful purposes while the country had been a Treaty member, and to maintain IAEA safeguards over them. An even stricter approach was proposed for all materials and technology received from abroad under the Treaty: a state withdrawing from the NPT would be required to freeze such activities under threat of UN Security Council sanctions in preparation for subsequent dismantlement and return to suppliers, under IAEA safeguards.¹⁴ These proposals and others were not implemented, however, due to the failure of the 2005 conference.

The practical ability to implement such measures is fraught with tremendous difficulty in such basic areas as maintaining such materials and technologies under the IAEA safeguards. As shown by the example of North Korea, states that have no fear of sanctions (even military) can expel the IAEA inspectors together with their equipment at any time, especially if the state is actually able to produce a nuclear weapon or nuclear explosive device, or at least give a convincing impression that it possesses it. From this perspective, it would be more effective to at least first dismantle and return the material and technologies, and particularly dual-use technologies (uranium enrichment and plutonium separation), and such measures should be implemented immediately following a state's withdrawal from the NPT without waiting for it to create a nuclear weapon. Expansion of IAEA safeguards in non-nuclear NPT member states would be one way to ensure the greatest possible amount of time between a hypothetical withdrawal from the Treaty and the creation of a nuclear weapon and to reliably exclude secret development of nuclear weapons prior to withdrawal from the NPT.¹⁵

It is this most direct approach of eliminating and returning technologies and materials, however, that would create the greatest legal, financial, and technical problems: compensation for the materials and technology acquired and paid for under contract, the removal of fuel, and dismantling of all the reactors and other facilities.¹⁶ Even more important is the fact that the only recourse if a state refuses to agree with such measures would be to enforce them through military occupation of the country. Military occupation, however, (which would most likely need to be preceded by a military action) would probably lead to a change of the political regime. That would then make it easier to ensure the return of the country to the NPT and the elimination of its military nuclear program, which in and of itself would resolve the issue of having to dismantle the installations and return materials and technology.

A Potential Solution to the Problem of Withdrawal From the NPT

It would appear that finding a solution to this issue, as well as reinforcing the nonproliferation regime within the framework of international law and common sense, will require a comprehensive

approach and coordinated political action among the great powers, all of the NPT adherents, the UN Security Council, the IAEA, and the other institutions and organizations. Based on an analysis of the history of the Iranian and North Korean cases, the following main proposals can be formulated:

Improvement of the IAEA safeguards and universalization of the 1997 Additional Protocol should reliably prevent concealed violations of the NPT and thus remove any question of withdrawing from the Treaty to conceal past violations.

A declaration of intent to withdraw from the NPT should elicit the following response: (1) the IAEA should conduct intensive inspections looking for any possible violations of the Treaty or the safeguards agreement; (2) an emergency NPT Review Conference should be convened to review the stated motives for withdrawal from the Treaty; (3) if the motives are found to be not in compliance with the requirements of Article X.1 and/or if the problem can not be resolved without withdrawal from the Treaty, the issue must be transmitted immediately to the UN Security Council for consideration under Chapter VI, Article 41, of the Charter of the United Nations.

Any resistance to IAEA inspections or failure to meet notification periods should immediately be considered cause for a UN Security Council decision to impose sanctions.

All materials and technology that the country possessed at the moment of its withdrawal from the Treaty, independently of their origin, must be used exclusively for peaceful purposes and remain under IAEA safeguards.

All dual-use technology and materials (uranium enrichment, plutonium separation) received from abroad or developed independently while the state was a Treaty member should be immediately mothballed, then dismantled and returned to suppliers under IAEA control. This especially concerns materials and technology acquired from abroad during the particular timeframe but outside the terms of the Treaty, i.e., in violation of the NPT and IAEA safeguards.

Refusal to comply with the latter two conditions should result in a UN Security Council decision to impose sanctions under Chapter VII, Article 42 of the United Nations Charter, including the possible use of military force.

Clearly, even such radical measures as these would not be able to fully guarantee that no state would ever withdraw from the Treaty.

However, they could provide quite a strong deterrent to such a step and reduce the amount of damage caused to international security. It is also obvious that all requirements of this type would have to be legalized by decision of the NPT member states and international legal acts through the United Nations. For example, the Nuclear Suppliers Group could make any future contracts on delivery of the respective technology under Article IV of the NPT conditional upon a mandatory requirement that the technology be dismantled and returned upon withdrawal from the NPT.

NOTES

- 1 *Nuclear Nonproliferation*, vol II. (Moscow: PIR Center, 2002), P. 28.
- 2 Such a threat could also arise should future new nations decide to pursue nuclear weapons, but review of this category would fall beyond the scope of the present study.
- 3 See: *Nuclear Proliferation in Northeast Asia*, ed. A. Arbatov and V. Mikheyev (Moscow: Carnegie Moscow Center, 2005); *Threats to the Nuclear Weapons Non-Proliferation Regime in the Greater Middle East*, ed. A. Arbatov and V. Naumkin (Moscow: Carnegie Moscow Center, 2005).
- 4 See: *Nuclear Weapons After the Cold War*, ed. A. Arbatov and V. Dvorkin, Carnegie Moscow Center, 137-362 (Moscow: ROSSPEN, 2006).
- 5 Some of these principles were examined in an article by two of the world's most respected experts in this field, G. Bunn and R. Timerbaev. See: G. Bunn and R. Timerbaev, "The Right to Withdraw from the NPT: Opinions of Two NPT Negotiators," *Yaderny kontrol* (PIR Center), no. 3 (2005).
- 6 *Ibid.*, P. 41.
- 7 J. Cirincione, J.B. Wolfsthal, and M. Rajkumar, *Deadly Arsenal: Tracking Weapons of Mass Destruction* (Washington: Carnegie Endowment for International Peace, 2002), PP. 241-254.
- 8 Bunn and Timerbaev, "The Right to Withdraw," P. 41, footnote 16.
- 9 *Ibid.*
- 10 In legal terms, the U.S. decision to withdraw from the ABM Treaty cannot be compared to the North Korean decision to withdraw from the NPT, since the United States had never been accused of past violations of the ABM Treaty, had observed the six-month notification period, and had provided a legitimate (if strategically questionable) motive. In addition, Article XV.2 of the ABM Treaty required no notification of the UN Security Council and stipulates no review by the latter.

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- 11 Bunn and Timerbaev, "The Right to Withdraw," P. 42, footnote 2.
 - 12 Ibid., P. 44, footnote 44.
 - 13 Ibid., P. 44, footnote 45.
 - 14 Ibid., P. 44, footnote 40.
 - 15 For more details, see: Timerbaev's chapter.
 - 16 *Universal Compliance: A Strategy for Nuclear Security* (Washington, D. C.: Carnegie Endowment for International Peace, 2004), <http://wmd.ceip.matrixgroup.net/UniversalCompliance.pdf> (last visited Jan. 14, 2005).

CHAPTER 16

NUCLEAR FUEL CYCLE

Anatoly Dyakov

It is now quite clearly understood that the greatest risk to the nuclear nonproliferation regime is the proliferation of the methods used to produce fissile nuclear materials. As the example of North Korea has demonstrated convincingly, a country that has access to the technologies of uranium enrichment and/or spent nuclear fuel reprocessing could potentially develop a nuclear weapon quickly, even while being a party to the Nuclear Non-Proliferation Treaty (NPT) and having its facilities under IAEA safeguard. Speaking figuratively, former IAEA director general M. ElBaradei has called the nuclear fuel cycle the “Achilles’ heel” of the nonproliferation regime.¹

The very presence of a breach in the nonproliferation regime as serious as the development of the NFC [nuclear fuel cycle], which some consider to be a loophole in the nonproliferation regime, naturally prompts questions about both the extent to which the NPT is meeting the goals of nonproliferation and its ability to adequately protect international security from new threats that may arise. Under current conditions, when the main threat is seen as being related to nuclear terrorism or to efforts by certain countries to acquire nuclear weapons, a top-to-bottom review and fundamental adaptation of NPT mechanisms and regimes will be required, as well as a detailization of the implications behind some of its requirements (particularly those concerning the scope of IAEA safeguards, the framework for peaceful nuclear cooperation under Articles III and IV, the procedures for withdrawing from the Treaty under Article X, the export control regime, and other measures). In this context, the nuclear fuel cycle will remain one of the more challenging issues.

Concerns about the sharp rise in oil and natural gas prices and shortages of fossil fuel reserves have led many countries in the world, including developing countries, to turn to nuclear power in order to satisfy their energy needs. Preservation of the international nucle-

ar nonproliferation regime will require that solutions be sought that on the one hand would prevent the proliferation of sensitive nuclear technologies, and that on the other would provide newcomer countries with the assurance of a supply of nuclear fuel and services.

The Outlook For Development of the Nuclear Power Sector

World demand for electric power is predicted to double over its 2007 figure and perhaps reach 22,000 GWhr by 2030.² To meet this growing demand for energy, many countries have been reconsidering the role of nuclear energy as an alternative means for power generation. The reasons for this increasing interest in nuclear power generation can be traced to finite reserves of fossil fuel, the need to cut pollutant emissions that can lead to climate change, and considerable improvements in nuclear reactor technology. In the years since the Chernobyl nuclear disaster, nuclear power plants have improved significantly in both reliability and efficiency. For example, while the capacity factor for most nuclear power plants in the 1970s had been on the order of 50 percent, today it is about 90 percent. Recent improvements have increased the installed capacity of current reactors by 20 percent, while extending their service lives to 60 or 70 years.

There are currently 438 power generation reactors with a total installed capacity of 372 GW(e) operating in the world and another 55 reactors under construction.³ According to IAEA forecasts, global nuclear power plant use could conservatively reach 473 GW(e) by 2030, or optimistically 748 GW(e).⁴ A Massachusetts Institute of Technology (United States) study presents an even more optimistic scenario for the development of nuclear power generation. The authors of this report estimate that some 60 nations will have acquired nuclear power generation capabilities by the year 2050, with a total installed capacity approaching 1,500 GW(e).⁵

Nuclear power generation is currently being developed with particular rapidity in the Southeast Asia and Pacific regions: China, India, Japan, and South Korea have developed and are implementing truly large-scale nuclear power generation development programs. It should be noted that of the 17 reactors commissioned over the past five years, 12 were built in Asia, and that 28 of the 37 reactors currently under construction are also located in this region.⁶

Other nations in the region (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) have also expressed an interest in acquiring nuclear power.

Some countries in Europe and the Near and Middle East have also declared their intention to develop a nuclear power generation capability. Construction plans for nuclear power generation reactors have been approved for Bangladesh, Belarus, Turkey, and the United Arab Emirates, while Algeria, Bahrain, Egypt, Israel, Kazakhstan, Kuwait, Libya, Morocco, Oman, Poland, Saudi Arabia, Tunisia, and other countries have announced plans to pursue nuclear power generation.⁷ According to IAEA director general Yukiya Amano, the number of countries using nuclear power to generate electricity could grow by an additional 10 to 25 by 2030,⁸ although how quickly or broadly this process will proceed is difficult to predict. Still, the growth in the number of nations turning to nuclear power generation is cause for a certain amount of concern, primarily with respect to the potential risk that this represents for the nuclear nonproliferation regime, primarily with respect to the proliferation of sensitive nuclear fuel cycle technology, such as the enrichment of natural uranium and reprocessing of spent nuclear fuel.

The Nuclear Fuel Cycle

Most modern power-generating reactors use fuel in which the primary component is U-235, which can support a chain reaction. Aside from uranium fuel, a number of European nations (such as France) also produce and use converted MOX fuels having plutonium as the fissile material.

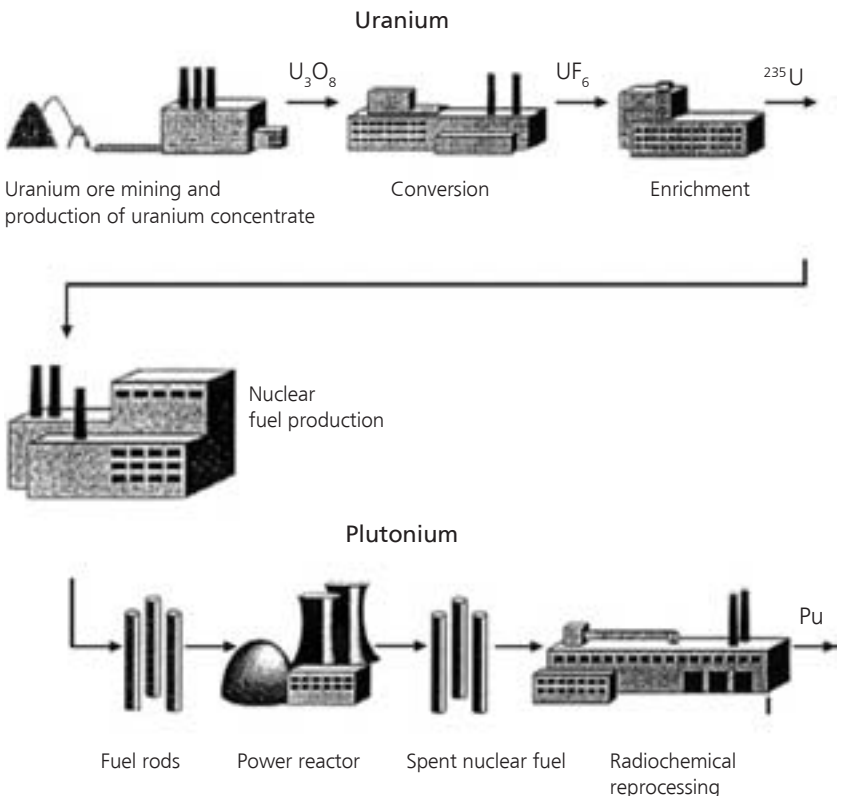
Natural uranium contains about 0.7 percent U-235 (the uranium isotope with a mass number of 235), with the remaining 99.3 percent consisting of U-238. Of these two isotopes, only U-235 can support a fission chain reaction that results in a release of energy. Natural uranium cannot sustain an explosive fissile chain reaction, and thus it cannot be used to produce weapons. However, once uranium has been enriched to more than 20 percent U-235, the IAEA defines it as a “direct use” material that could be used to create a relatively compact explosive device. Uranium that has been enriched to beyond 90 percent U-235 is classified as “weapons-grade” material and can be used in nuclear weapons. To enrich uranium beyond the natural level

of U-235 requires quite sophisticated isotope separation technology.

Plutonium is an artificial element that does not occur naturally. It is produced when a U-238 nucleus captures a neutron, initiating a decay chain through the short-lived U-239 and Np-239 isotopes to Pu-239. The most appropriate device for producing plutonium is a nuclear reactor operating on either natural or low-enriched uranium. As the reactor operates, the process described above leads to an accumulation of plutonium in the fuel that can be recovered through chemical reprocessing of the spent nuclear fuel.

The NFC is customarily divided into two stages: the beginning (front-end) and the end (back-end). Figure 1 shows the main elements in the uranium and plutonium fuel cycles and indicates the stages where weapons-grade nuclear materials (U-235 and Pu) could appear.

Figure 1. The Main Components of the Nuclear Fuel Cycle



The front-end stage of the NFC begins with the mining of uranium ore and production of U_3O_8 concentrate. This uranium concentrate is then shipped to a conversion facility where the U_3O_8 is converted into uranium hexafluoride (UF_6), which is solid at room temperature but becomes a gas at $57^\circ C$. The UF_6 is then shipped to enrichment facilities to increase the concentration of the U-235 isotope. The product of this enrichment process is then sent to a facility that converts it into uranium oxide (UO_2), used in the production of nuclear fuel. As a rule, the degree of enrichment for fuel used in commercial power generation reactors is 4-4.5 percent.

The spent nuclear fuel contains mostly uranium enriched to about 1 percent, plutonium, and other decay products. One ton of spent nuclear fuel contains about five to eight kilograms of plutonium. The back-end stage of the NFC includes a process of cooling the spent fuel in ponds of water to lower its temperature. After three to five years of storage in the ponds (depending on the treatment procedure used), the fuel is either subjected to radiochemical reprocessing or placed into permanent storage. This reprocessing produces uranium, plutonium, and highly radioactive nuclear waste. The waste products are designated for final disposal, while the uranium and plutonium can be recycled into the production of nuclear fuel.

It is important to note that the front-end stages of the uranium fuel cycle are precisely the same as those used for manufacturing weapons-grade uranium. However, not all stages of the NFC are equally critical to the nonproliferation regime: most sensitive are the enrichment and reprocessing of spent nuclear fuel.

There are currently two enrichment technologies used in industrial facilities: gas diffusion (GD) and isotope separation using gas centrifuges (GC). Isotope separation is measured in "separation work units" (SWU). The efficiency of the various technologies and the capacities of uranium enrichment facilities are measured in SWU/year. It takes about 200 SWU to produce one kilogram of weapons-grade uranium, for example, but only seven to eight SWU to enrich one kilogram of uranium to 4 percent for commercial power reactor fuel.

The countries with uranium enrichment facilities are listed in Table 2.⁹

Table 2.
Countries With Uranium Enrichment Facilities

Country	Enrichment Method	Capacity (thousand SWU per year)
Brazil	GC (under construction)	120
China	GC	250
France	GC (under construction)	7500
Germany	GC	4500
Great Britain	GC	4000
India	GC	
Iran	GC (under construction)	100-250
Japan	GC	1050
The Netherlands	GC	3500
Pakistan	GC	170
Russia	GC	~30,000
The United States	Laser (under construction)	3500-6000
	GC (under construction)	6500-9500

Note: The British, Dutch, and German enrichment enterprises are owned by the global URENCO Enrichment Company.

Although the use of gas centrifuges has proven to be the more economical method of uranium enrichment and has come to dominate the industry today, it must be noted that certain technical characteristics of centrifuge technology also create the greatest threat to the nonproliferation regime. First, this method has a high stage separation factor (1.3-1.7) and UF_6 moves through the enrichment cascade quite rapidly. Only about 15 enrichment cycles are needed to produce fuel-grade uranium, while it takes about 40 cycles to enrich uranium to weapons grade. As a result, it takes only a short time (a matter of days) to reconfigure the centrifuge cascade from the production of low-enriched to that of weapons-grade uranium. This in turn makes the NPT “breakout” scenario possible, where civil technology is rapidly transformed to military use. Second, clandestine centrifugal enrichment facilities are difficult to detect, yet even a small-sized plant could produce enough highly-enriched uranium to make one or two nuclear explosive devices per year. The amount of electric power required for the enrichment (about

50 kWh/SWU) is comparable to the amount needed for lighting the plant where the enrichment takes place.

The reprocessing of spent nuclear fuel also represents a serious threat to the nonproliferation regime, since it results in the separation of plutonium. Spent uranium nuclear fuel from any type of reactor will contain a certain amount of plutonium. However, due to the fuel's high radioactivity, its plutonium remains quite unavailable unless and until it has been embedded in the spent fuel. From a technical standpoint, the process of fuel reprocessing is no secret and has been described in some detail in the literature. At the same time, the practical implementation of spent fuel reprocessing necessarily implies that reliable radiation shielding and remote manipulation systems also be developed, which results in significant expenditures. Additionally, it is more difficult to conceal the chemical reprocessing of spent nuclear fuel, since it is associated with the production of radioactive krypton-85, an easily detectable gas: "wisps" of radioactive krypton gas can be detected in the atmosphere up to several hundred kilometers away from the spent nuclear fuel processing facility.

Security Measures For the Nuclear Fuel Cycle

Obviously, in light of the anticipated widespread use of nuclear power, preservation of the nuclear nonproliferation regime will require countering the proliferation of sensitive nuclear technology on the one hand, while ensuring a guarantee of access to peaceful nuclear power for interested countries on the other.

At present, the civil nuclear power generation sector relies primarily upon the use of light water reactors, which account for 88 percent of installed capacity. Reactors of this type use low-enriched uranium fuel. One radical solution might be to switch to innovative nuclear power technologies that could sustain the nonproliferation regime based upon intrinsic physical and technological properties. This would require the development of new types of power reactors and fuel cycles. Work along these lines has already begun under a number of international projects, including Generation IV, the International Project in Innovative Nuclear Reactors and Fuel Cycles (INPRO), and GNEP+ANFC. However, even if the creation and use of such innovative nuclear technologies could be counted on,

it would only be for the distant future. Over the next few decades, nuclear power generation will continue to expand based exclusively on the use of light water reactors and existing fuel cycle technologies. Thus, a solution to the nonproliferation problems caused by the potential increase in the number of nations using nuclear power should be sought through the implementation of new institutional, economic, and political barriers. All of these measures, while not creating obstacles to the development and use of nuclear power by newcomer countries, would induce them to voluntarily renounce acquisition of NFC technologies.

Countries are usually motivated to pursue NFC technology for the following reasons:

- to improve national security and enhance national prestige by gaining a nuclear weapons potential;
- to ensure national energy independence and security;
- to gain economic benefit.

Brazil and Iran, for example, could be considered to have been developing NFC technology primarily for the first and second of these reasons. At the same time, both motives could apply in one combination or another, or the second could officially be used to conceal the first.

The argument of economic benefit as justification usually appears rather dubious. The cost of nuclear fuel (including the price of uranium and cost of uranium enrichment) comprises only a small fraction of the costs of the electricity produced by a reactor. Even a tenfold increase in the price of natural uranium (from 30 to 300 dollars per kilogram) would result in no more than a 20 percent increase in the cost per kilowatt hour.¹⁰ Similarly, a doubling of the price per SWU would increase the cost of a single kilowatt hour by only a few percent.¹¹ Thus, the argument in favor of acquiring enrichment technology for the economic benefit remains unconvincing. Whether or not such enrichment plants are being developed to export their products (where the economic benefits would be tied to global market conditions) is a different question.

On the other hand, the energy security argument for acquiring NFC technology is very convincing, requiring that global market capabilities be studied to guarantee that the entire range of civil NFC products and services be reliably provided, above all those relating to deliveries of uranium and the provision of enrichment services. Without such guarantees, no nation (particularly if it is considered

a “problem” country) could be expected to abandon the idea of acquiring its own enrichment facilities.

Current annual global demand for natural uranium (U_3O_8) to fuel all 438 reactors comprises approximately 81,000 tons, while the amount being mined is just over 56,000 tons.¹² The difference between demand and production is covered primarily by previously acquired reserves. In the future, however, in light of the predicted growth in the nuclear power sector to a level of 680 GW, annual uranium mining will need to reach a level of at least 120,000 tons, which implies a substantial increase over current mining capacities (currently at a level of about 60,000 tons). Considering that proven natural uranium reserves that will cost no more than 130 dollars per kilogram to mine amount to 4.7 million tons, the demand for natural uranium under this development scenario for nuclear power generation should easily be satisfied for many decades to come.

Global demand for enrichment services in 2009 was 42 million separation work units.¹³ Under the conservative development scenario for nuclear power generation (680 GW by 2030), annual demand for such services could be expected to reach about 82 million SWU, assuming the operation of only light water reactors. The global market in uranium enrichment services is currently dominated by four main players (EURODIF, TENEX URENCO, and USEC), which combine to supply 95 percent of the total global demand.

The U.S. company USEC has used the gaseous diffusion technology for uranium enrichment for many years. Its two plants in Paducah and Portsmouth are capable of producing 18.4 million SWU per year. However, the Portsmouth plant is currently idle and is not likely to resume operation. The gaseous diffusion method consumes dozens of times more energy than centrifugal enrichment, which makes it far less economical.¹⁴ Four new enrichment plants are planned for construction in the United States, three of which will be based upon the gas centrifuge method and one on laser enrichment. A new plant planned for Piketon, Ohio, will produce 3.5 million SWU per year using recently developed U.S. centrifuge technology. The enrichment facility at Eunice, New Mexico, will use URENCO centrifuges to produce three million SWU per year. The AREVA company is planning the construction of a three million SWU per year plant in Eagle Rock, Idaho, using URENCO technology. In Wilmington, North Carolina, the Global Laser Enrichment company is teaming up with General Electric Hitachi and Cameco to build a three million

SWU per year enrichment plant using Silex laser technology developed in Australia.¹⁵

The multinational company EURODIF, a member of the French AREVA group that also includes partners from Belgium, Iran, Italy, and Spain, operates the Georges Besse gaseous diffusion plant in Tricastin, France, with a production capacity of up to 10.8 million SWU/year. Although the nations participating in this company enjoy guaranteed access to enrichment services, France alone retains ownership of the enrichment technology. The gaseous diffusion technology used at Georges Besse is currently being replaced with centrifuge technology. The modernized plant will have an installed capacity of 7.5 million SWU per year, which can be increased to 11 million SWU per year if necessary.¹⁶ The first centrifuge line at the plant was commissioned in December 2009, with the facility expected to begin full production in 2016.¹⁷

The multinational URENCO company (Germany, Great Britain, and the Netherlands) also employs centrifuge technology for uranium enrichment. The company's three plants are planned to reach a total capacity of 12 million SWU per year by the end of 2012.¹⁸

The Russian TENEX company has four enrichment plants using sixth-, seventh-, and eighth-generation gas centrifuges to produce a total of about 24 million SWU. Under the recently adopted Russian enrichment modernization program, older-generation centrifuges are being replaced with more recent models, and total annual production is expected to reach 28.8 million SWU by the end of 2010.¹⁹

It must be said that from the very inception of the nuclear power sector, the uranium and uranium fuel market has maintained extremely high supply security standards, with not a single instance of a power generation reactor shutting down due to an interruption in the fuel supply. Global uranium enrichment capacities will continue to exceed demand for the foreseeable future. Considering the dynamism and potential capabilities of the uranium enrichment market, it can be assumed that it will be economically and technologically capable of continuing to satisfy any rise in future demand for these services under any development scenario.

The risk does remain, however, that some consumers will be unable to obtain nuclear fuel cycle services on the market, primarily for political reasons. Thus, conditions would need to be established so that any consumer who strictly observes **all nuclear nonproliferation commitments** would be granted convincing guarantees of NFC services.

Former IAEA director general M. ElBaradei believes that this could be accomplished by developing and establishing a multilateral nuclear fuel cycle mechanism.²⁰ Such a mechanism would neither undermine national sovereign rights to the peaceful use of nuclear energy nor create yet another discriminatory barrier between those who “can” and those who “cannot” have NFC technology, yet it would provide a way to guarantee the provision of NFC services on a non-discriminatory basis and be an effective incentive for nations to refrain from acquiring such technology on their own.

Guaranteed Nuclear Fuel Cycle Services

Experts at the World Nuclear Association believe that the creation of such a mechanism would require the development and implementation of a range of measures aimed both at bolstering the current NFC services market and ensuring that cost-effective services are provided to any nation that uses nuclear energy and has renounced the acquisition of sensitive technology.²¹ This initiative was introduced following the disclosure in 2003 of the existence of a secret network that had been created by Pakistani nuclear scientist A.Q. Khan for the export of nuclear technology and equipment.

In a speech before the session of the United Nations General Assembly on November 3, 2003, the **director general of the IAEA** suggested that the world consider restricting uranium enrichment and fuel processing exclusively to facilities under multinational control.²² In 2004 he established a group of international experts to consider possible approaches and incentives to attract states to create a multi-lateral NFC. In its report, this group proposed the following:

- to guarantee the supply of fuel to nuclear power generating reactors;
- to convert existing national NFC facilities to multinational facilities;
- to create multinational regional NFC facilities under joint ownership.²³

At the same time, the report noted that there were no provisions under international law to require countries to join a supply assurance program of this kind.

Between 2004 and 2007, there were over a dozen initiatives advanced by various countries and organizations aimed at prevent-

ing the proliferation of sensitive NFC technology, all of which suggested primarily that nuclear fuel supplies be guaranteed and that international NFC service centers be established.²⁴

The initiatives of U.S. President George W. Bush. In order to close the loophole in the Nuclear Non-Proliferation Treaty that allowed countries to acquire NFC technology legally, in 2004 the U.S. president appealed to the countries belonging to the Nuclear Suppliers Group to refrain from providing uranium enrichment or spent nuclear fuel reprocessing technologies to any country that currently lacks operational enrichment or processing facilities of its own, and to ensure reliable access to nuclear fuel at a “fair” price to those countries that have agreed to refrain from acquiring such technology.²⁵ This initiative, however, failed to gain support, since it suggested creating yet another level of discriminatory division of NPT members (in addition to the existing one) into “legally” nuclear nations and non-nuclear nations. The main question remained unanswered: which countries would be allowed to have the NFC, and which would not? In the final result, President Bush’s initiative worked not so much to enhance the NPT as to weaken it. As the example of Iran has shown, another division of nations into those that are permitted to have enrichment and reprocessing capabilities and those that are not would work against achieving unity among the member nations and would stimulate the development of a “nuclear black market.”

In February 2006, President Bush proposed a more in-depth initiative on preventing proliferation called the Global Nuclear Energy Partnership (GNEP), which proposed using new types of nuclear reactors and further improvements to the NFC to develop the civil nuclear power sector and suggested establishing an international consortium of nations that possess enrichment and processing technology (China, France, Great Britain, Japan, Russia, and the United States), which would refuse to provide or transfer processing technology to other countries while offering guaranteed fuel cycle services, including the lease of fresh nuclear fuel and the return of spent fuel, to any countries that would forego development of their own enrichment and reprocessing technologies.

However, due to the complexity of the program, doubts in its ability to address matters of nuclear technology nonproliferation, and criticism of the program by experts outside the government who were particularly troubled by its domestic spent nuclear fuel component, the U.S. government was forced to abandon the idea of implement-

ing these measures within the country.²⁶ The international aspect of the program is currently under review. It appears that the United States would like to retain it, but structure it differently and give it a new name.

The initiatives of Russian President Vladimir Putin. In January 2006, Russian President Vladimir Putin proposed creating an international center under joint ownership with other countries in order to provide nuclear fuel cycle services (including uranium enrichment) on a non-discriminatory basis and under the control of the IAEA.²⁷ Under this initiative, Russia announced the establishment of the International Uranium Enrichment Center (IUEC), where any nation that sought to develop peaceful nuclear power but not to acquire sensitive technology would be entitled to conclude an intergovernmental agreement with Russia to become a full co-owner (i.e., shareholder) of the IUEC. One of the key principles of the operation of this center would be the fact that its production facilities remain under IAEA safeguard, while the option of IAEA participation in the management of the center is left open. IUEC co-owners would be guaranteed the following:

- supply of low-enriched uranium or provision of enrichment services;
- participation in management of the IUEC;
- access to all information on prices and contract terms and confidence in their fairness;
- a share of the revenues from this quite profitable business.

Only the actual enrichment technology itself would remain unavailable to the foreign co-owners.

The Russian IUEC initiative has essentially entered the implementation stage. With conclusion of an intergovernmental agreement between Russia and Kazakhstan, the process of establishing the IUEC at an existing enrichment facility in the city of Angarsk (Irkutsk Oblast) was nearly complete, and the Center has since begun operation.²⁸ Armenia signed on to activities at the Center in February 2008,²⁹ and a number of other countries, including India, Japan, Mongolia, South Korea, and Ukraine, have also expressed an interest in participating in the IUEC.³⁰

Other initiatives. In June 2006, six nations with their own enrichment activities (France, Germany, Great Britain, the Netherlands, Russia, and the United States) proposed a “Concept for a Multilateral Mechanism for Reliable Access to Nuclear Fuel,” under which guar-

anteed supplies of low-enriched uranium for nuclear fuel would be offered to those nations that have foregone creating their own national enrichment facilities and signed comprehensive safeguards agreements with the IAEA, including the 1997 Additional Protocol. The idea behind this project was that if a situation should arise under which one of the six nations would be unable to meet its LEU delivery obligations, the other five nations would make the shipments in its place, provided that the IAEA has confirmed that the nation has met all of its nonproliferation obligations. The implementation of this initiative assumes that a multi-tiered system of safeguards would be established that would include backup provisions in standard contracts and would establish LEU stockpiles under IAEA control. In September 2006, Japan proposed the IAEA Standby Arrangement System to supplement the Six Country Project and serve as an early warning system to avoid disruptions to nuclear fuel supplies. Finally, in September 2006, the United Kingdom proposed implementing an “enrichment bond” concept to provide greater assurances to the nations seeking nuclear fuel cycle services.

In September 2006, the Nuclear Threat Initiative (a U.S. non-governmental organization) announced that it would contribute 50 million dollars as seed money to help create an LEU stockpile owned and managed by the IAEA.³¹ The Agency would manage this stockpile in order to guarantee non-discriminatory and non-political fuel supplies to the nations that have renounced enrichment activities. However, the use of the NTI money would be conditional on the requirement that one or more IAEA members would contribute an additional 100 million dollars in funding. This circumstance, as well as the lack of resolution of some other unresolved issues (such as the degree of LEU enrichment, storage locations, the production of fuel from the stockpile for specific client nations, and the price) have made this proposal difficult to implement.

Russia has also supported the initiative to establish a nuclear fuel bank. Speaking at the 51st IAEA General Conference, Sergey Kirienko, director general of the Russian Federal Atomic Energy Agency (Rosatom), announced Russia’s intention to create a low-enriched fuel stockpile at the Angarsk IUEC. The IAEA Board of Governors supported this Russian initiative in a resolution passed on November 27, 2009. In late March 2010, an agreement was signed to establish a stockpile of low-enriched uranium within the borders of the Russian Federation.³² It provided for the establishment of a guaranteed physical

“rainy day” stockpile of 120 tons of LEU in the form of UF_6 enriched to between 2.0 and 4.95 percent to be stored at the IUEC under IAEA safeguards for the exclusive use of IAEA members in order to resolve problems in the event of an interruption in the supply of LEU. Russia will also bear the costs of applying the IAEA safeguards.

The internationalization of NFC services and unresolved issues.

As noted above, international law currently does not require countries that purchase nuclear fuel to participate in international NFC centers. Moreover, as discussions surrounding the proposed initiatives at an IAEA seminar on the issue in September 2006 have made clear, the majority of nations would oppose any plan reinforcing their division into suppliers and consumers of nuclear fuel, seeing any attempt to create a system that is not perceived to be fair and aimed at universal rights as a creeping trend against the fundamentals of the NPT. The NPT contains no restriction on peaceful nuclear activity, including enrichment, and the countries of the third world have no intention of renouncing their right to do so. The prejudice against any attempt at internationalizing the nuclear fuel cycle was clearly evident during the IAEA vote on the Russian fuel bank proposal, when several third world countries voted against the measure or abstained.³³

Consequently, the ultimate success of the proposed initiatives will be determined primarily by the nuclear fuel consumer nations through their choice to use **the world market for NFC services** rather than developing NFC capabilities of their own. Clearly, the only way to induce more nations to do the same would be by guaranteeing them reliable supplies of fuel at better prices.

The idea of creating an LEU and nuclear fuel bank under IAEA safeguards and at reduced cost for countries that have renounced the NFC would raise a number of problems. Although the fundamental idea may appear attractive and “brilliantly simple,” the devil, as they say, is in the details. For example, who is to pay the cost of operating the uranium enrichment and fuel processing plants and at what price? If the nuclear materials are to be delivered to “reliable” clients at reduced cost, who would cover the difference between the market price and the discounted price while maintaining profitability and the ability to pay investor dividends? The IAEA budget lacks the funds to cover such expenditures, and the Agency is not authorized to conduct any commercial activity.

The establishment of international enrichment centers would also raise broader questions: what will happen to the nuclear materials

market once these centers begin to supply LEU at essentially fixed cartel prices? What guarantees are there that this price would in fact be the lowest possible and thus be able to provide enough of an incentive to the fuel consuming nations to renounce their own NFC? Is there a way to ensure that a “guaranteed supply of LEU” would not be turned into an instrument for blackmailing the Agency by the consuming countries into gaining ever-greater discounts and preference in nuclear cooperation under Article IV of the NPT? After all, any country would theoretically lay claim to such preferential supply (and perhaps also for manufactured fuel) by declaring that it would otherwise begin developing its own nuclear fuel cycle.

The establishment of such multilateral NFC centers (MNFC) would also bring about a number of economic, technical, and legal difficulties. Would the right of a country to obtain LEU or nuclear fuel depend upon its share in the MNFC, or only upon its decision to renounce the NFC, with prices and amounts dependent upon global market conditions? In other words, if a country has decided not to contribute to the MNFC, would it still be eligible for guaranteed deliveries if it merely renounced a nuclear fuel cycle program of its own? What would the economic relationship be between the Center and the national uranium export companies, especially those belonging to countries that also participate in the MNFC abroad? Would this mean that the guaranteed LEU supplies from the future MNFC would displace those of the national uranium enrichment companies, leaving them to supply the markets of the NFC countries exclusively? How would losses to the MNFC companies that have resulted from guaranteeing the supply of LEU at discounted prices be offset? Which MNFC member countries would be responsible for returning spent nuclear fuel to their territories and reprocessing and storing it?

Moreover, by monopolizing two key areas of the NFC (uranium enrichment and spent nuclear fuel reprocessing), the MNFC could also negatively impact the markets for other stages of the NFC: the manufacture of uranium concentrate, uranium hexafluoride, and reactor fuel rods. This applies particularly to fuel rods, since the certified delivery of the fresh rods and the subsequent removal of spent rods for processing are both closely associated technically and economically to delivery of the reactors themselves.

Finally, the success of the initiative proposed by IAEA leadership for a progressive internationalization of the fuel cycle (implied by plans for expansion of the MNFC) would ultimately depend upon

achieving progress in prohibiting the production of fissile material for military purposes. It could hardly be expected that all of the countries that lack NFC technology would agree to link their nuclear power industries to the MNFC for all time unless all of the other countries that have the technology to produce fissile materials (including the five nuclear members of the NPT and the four “outsiders”) have formally agreed to prohibit the production of fissile materials for weapons, and while their enrichment plants and spent nuclear fuel reprocessing facilities remain beyond IAEA safeguards. This issue could potentially be resolved in principle through negotiations on the Fissile Material Cut-off Treaty (FMCT) at the Conference on Disarmament in Geneva, although these talks have long been deadlocked as a result of disagreements among the members over the military, strategic, technical, and political aspects of the Treaty.

All of these questions will require objective, detailed, and competent consideration, building on the experience gained through analysis of the subject conducted in the 1970s and 1980s. Current practical solutions to the various aspects of the problem of the nonproliferation of nuclear fuel cycle technology must also be evaluated. In this respect, the construction of a nuclear power plant in Iran by the Russian company Atomstroyexport is of particular interest. Under the intergovernmental agreement, Russia has assumed responsibility for providing the fresh fuel for the Bushehr plant and for removing the spent nuclear fuel. The extension of such practices to all countries that are beginning to develop nuclear power would be in line with the requirement for ensuring security of the NFC. A side benefit of this approach for the nuclear fuel consumer countries would be the fact that it would relieve them of the serious problem of dealing with spent nuclear fuel and would thus remove the main obstacle to their national nuclear power development programs. On the other hand, as the experience with Iran has shown, such bilateral agreements in themselves would not necessarily eliminate a nation’s desire to develop its own nuclear fuel cycle.

It is no secret that the current interest in the fuel cycle problem is due primarily to the protracted crises surrounding the nuclear programs of Iran and North Korea. The precedent set when North Korea withdrew from the NPT and developed nuclear weapons using resources obtained during its cooperation with the IAEA has forced the international community to take an extremely critical view of the Iranian NFC program, which, moreover, is being carried out

in violation of IAEA safeguards. However, the new NFC concepts are unlikely to seriously affect resolution of the problem that the nuclear programs of these two nations have created. These issues are now being addressed through multilateral negotiations, which are considering individual solutions for each case. The best that could be hoped for is that one approach or the other to guaranteed deliveries of LEU or finished fuel would be included as a component of such agreements. However, the issue of internationalizing the NFC must not be allowed to be forgotten, even should the Iranian and North Korean crises be resolved positively. Otherwise, a repeat of these difficulties and risks will become all but unavoidable.

On the whole, both extensive development of nuclear power generation and prevention of the proliferation of sensitive nuclear technologies through proliferation of the fuel cycle will be possible provided the following fundamental conditions are met:

- the members of the NPT must reach understanding on the need for renouncing the construction of any new national enrichment facilities, including those of low capacity;
- the countries that already possess enrichment technology must act to transition fully to MNFC over the long term;
- these efforts must be aimed both at strengthening the existing nuclear services market through long-term contracts with greater transparency, and at offering guaranteed and non-discriminatory NFC services to any NPT member nation that has abandoned domestic development of uranium enrichment or spent nuclear fuel reprocessing technology;
- aside from the price incentive system, a comprehensive system of technological and commercial compensation should be developed to offer the nations that have renounced the NFC;
- newcomers would receive assistance in developing their nuclear power generation sector from the nuclear technology supplier nations only after they have joined the 1997 Additional Protocol;
- the potential transition to MNFC under the auspices of the IAEA should be accompanied by expansion of the 1997 Additional Protocol to apply to the full civil nuclear infrastructure of the nuclear powers, and if the FMCT is concluded, to all their uranium enrichment and spent nuclear fuel reprocessing facilities as well.

NOTES

- 1 *Multilateral Approaches to the Nuclear Fuel Cycle: Report by the Expert Group Presented to the IAEA Director General*, April 28, 2005, INFCIRC/640.
- 2 *Report on Proliferation Implications of the Global Expansion of Civil Nuclear Power*. (International Security Advisory Board, Apr. 7, 2008); *International Energy Outlook 2006*, U.S. Department of Energy (Washington, D.C., June 2006), <http://www.eia.doe.gov/oiaf/ieo/index/html>.
- 3 <http://www.iaea.or.at/programmes/a2/>.
- 4 *International Status and Prospects of Nuclear Power: Report by the Director General*, Aug. 12, 2008, GOV/INF/2008/10-GC(52)/INF/6.
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CHAPTER 17

NONPROLIFERATION INSTITUTIONS

Alexander Kalyadin

The spread of nuclear weapons and potentially dangerous nuclear technologies, equipment, and materials is one of the most serious security challenges facing the world community today. The World Nuclear Association predicts that over the next twenty years around 30 countries will acquire the capability to produce enriched uranium and plutonium and create nuclear explosive devices.¹

This has placed severe strain on the Nuclear Non-Proliferation Treaty (NPT)² and the global legal regime based on this treaty. The NPT has no internal mechanisms to deal with violations of its provisions. Such cases must be submitted to the IAEA Board of Governors for consideration, which is authorized to report any nuclear activities affecting international peace and security to the UN Security Council.³

The lack of the NPT enforcement arrangements has become especially notable in recent years. International discussions on the subject in 2008-2009 focused on the nuclear programs of Iran and North Korea, which had both been sanctioned by the UN Security Council for flouting their nonproliferation obligations.

The practice of applying sanctions to date has highlighted the need to improve compliance and enforcement arrangements and strengthen the relevant institutional mechanisms. Among other things, this will require effective methods and instruments of defeating proliferation activity of any kind.

The UN Security Council's Prerogatives to Enforce Compliance

The UN Security Council possesses broad legal powers to act quickly and resolutely to thwart proliferation. Article 39 of the UN Charter authorizes it to take coercive measures in response to "any threat

to the peace, breach of the peace, or act of aggression.” Chapter VII “Action with Respect to Threats to the Peace, Breaches of the Peace, and Acts of Aggression,” provides a clear-cut system of actions aimed at preserving international peace and stability.

The authority and responsibility to take such measures within the UN framework are concentrated in the Security Council, on which the UN member states **have conferred major responsibility for maintaining international peace and stability, and which they have empowered** to take necessary enforcement action.⁴ Its prerogatives allow it to play a leading role in global counterproliferation efforts. This global body has exclusive authority (in cooperation with the IAEA) to determine the existence of a threat to international peace and security posed by proliferation activities and decide what measures should be taken to remove it. Acting on behalf all of the members of the United Nations, it can make the decision to resort to measures associated with economic, political or other types of pressure (Article 41),⁵ or the use of military force (Article 42).⁶ The Security Council is the only UN agency the decisions of which are mandatory for all members of the organization. Under Article 25 of the UN Charter, member states of the United Nations agree to carry out decisions of the Security Council. Article 25 authorizes the Security Council to oblige all members of the United Nations to impose economic and other sanctions on a state that has violated nonproliferation rules and poses a threat to international security.

In 1992, the Security Council qualified the spread of all kinds of weapons of mass destruction as a “threat to international peace and security.”⁷ In subsequent years this global body made decisions on nonproliferation sanctions against states found in material non-compliance with the NPT regime when **milder political and diplomatic** methods proved ineffective in ensuring compliance with its basic requirements.

The summit of the UN Security Council member states on September 24, 2009, reaffirmed that the proliferation of weapons of mass destruction and their delivery means “constitutes a threat to international peace and security.” The first paragraph of Resolution 1887 (which was adopted unanimously) emphasized the UN Security Council’s primary responsibility as addressing threats to international peace and security brought about by failures to comply with nonproliferation obligations. It also stressed that “a situation of non-compliance with nonproliferation obligations shall

be brought to the attention of the Security Council **which will determine** if that situation constitutes a threat to international peace and security.” The Resolution stated the resolve of the Security Council to **monitor closely any situation involving the proliferation of nuclear weapons and to take such measures as may be necessary** for the maintenance of international peace and security. In particular, in Resolution 1887 the Council urged **the parties concerned** to comply fully with their nonproliferation obligations under the relevant UNSC resolutions (UNSCR).⁸ Resolution 1887 identifies a number of important measures to complement and strengthen the NPT regime.

It follows from the above that in the sphere of nonproliferation enforcement, a great deal has been left to the discretion of the UN Security Council. Regrettably, it has so far not been able to commit the **full force of its potential power to ensure compliance with the central provisions of the NPT**. In this context, it would be appropriate to review the anti-proliferation sanctions which were imposed upon Iran and North Korea for failures to comply with the NPT regime.

Sanctions Against the Iranian Nuclear Program (INP)

Under the 1970 NPT and the 1974 agreement between Iran and the IAEA,⁹ Tehran assumed the international legal obligation not to acquire nuclear weapons and to place its nuclear activities under the IAEA safeguards.

Iran, however, began carrying out undeclared nuclear activities in the **late 1980s and continued to do so until the early 2000s**, including purchasing dual-use technology from illegal nuclear supplier networks.¹⁰ There is some evidence that Iran’s nuclear efforts were assisted by an underground network of nuclear material and technology traders headed by the Pakistani nuclear scientist A.Q. Khan.¹¹

In February 2006, the director general of the IAEA sent a report to the UN Security Council in which he informed that body about the demand by the IAEA Board of Governors that Iran implement a series of specific steps in order to regain international trust in its nuclear activities. **The report listed outstanding questions and problems** with regard of Iran’s past nuclear activities, including the themes which might have a military dimension.

The IAEA Board of Governors urged Iran to return to the system of complete and consistent suspension of all activities related to **uranium enrichment or reprocessing (including research and development work)**; to reconsider its plans to build a heavy water research reactor; to ratify and fully implement the IAEA Additional Protocol on Safeguards Agreements (APSA),¹² and in anticipation of ratification to continue to act in accordance with its provisions; and to **implement transparency measures, in particular by ensuring that the IAEA have access to persons and documents related to the acquisition of dual-use equipment.**¹³

Initially, the Security Council confined itself to expressions of support for the decision of the IAEA Board of Governors to urge Iran to meet its demands,¹⁴ but once Tehran defied these demands, the Council moved on to sanctions. **The UN Security Council unanimously adopted Resolution 1737 on December 23, 2006, and imposed sanctions on Iran under Article 41 of Chapter VII of the UN Charter**¹⁵ against its uranium enrichment activities as well as against its projects relating to the heavy water reactor and the production of delivery vehicles for nuclear weapons. The Resolution prohibited the import or export of any items, materials, equipment, goods, and technology that could contribute to Iran's nuclear weapons and ballistic missile development programs, and also called upon the UN member states to freeze **the foreign accounts of several Iranian organizations and individuals having links to the Iranian military program.**¹⁶ A special Sanctions Committee was set up by the Security Council.

Since Iran refused to comply with the previous UNSC resolutions related to the INP, the sanctions regime against it was expanded through the passage of new UNSC resolutions on the INP (Resolution 1747 of March 24, 2007,¹⁷ and Resolution 1803 of March 3, 2008).¹⁸ The number of Iranian individuals and organizations linked to sensitive nuclear activities that were subject to the sanctions was increased from 22 on December 22, 2006, to 75 in March 2008.

The list of prohibited goods was also expanded to include all dual-use equipment and materials regulated by the Nuclear Suppliers Group (NSG).¹⁹ The Resolution authorized UN member states to carry out inspections at their own airports and seaports of cargo aboard aircraft and vessels owned or operated by **certain Iranian companies, provided that there were "reasonable grounds to believe" that the cargo contained goods prohibited under the sanctions.**

The resolution also urged **freezing the foreign assets of about a dozen companies and another dozen individuals connected to the INP, including Bank Melli and Bank Saderat, which were suspected of complicity in the proliferation of arms.** The list of individuals prohibited from traveling abroad due to links to the Iranian nuclear program was expanded. Under the Resolution, Iran was required to reduce its missile program.

At the same time, the sanctions retained their targeted and limited character involving only those aspects that directly threatened the NPT regime. They did not affect the nuclear power plant under construction in Bushehr or the assistance that Iran received from the IAEA in the peaceful use of nuclear power. **The adopted sanctions proved insufficient to induce Tehran to take the measures demanded by the UNSC and the IAEA.**²⁰

On September 27, 2008, IAEA Director General Mohammed ElBaradei presented his report on the significant progress that Iran had made in gas centrifuge uranium enrichment, leading the Security Council to unanimously adopt Resolution 1835,²¹ which called upon Iran to comply with its obligations under the previous resolutions of the UN Security Council **and to meet the requirements of the IAEA Board of Governors fully and without delay.** However, **because of difficulties experienced by the permanent members of the Security Council in coordinating their positions, no additional sanctions were introduced against Iran at that time, and the Security Council confined itself to reaffirming its previously adopted resolutions on the matter and supporting a dual-track approach to the Iranian nuclear issue.**

The dual-track approach combines sanctions (to prevent Iran from moving on to the **development of nuclear weapons**) with **“positive incentives”** to increase Tehran’s interest in cooperation with the IAEA and compliance with its nonproliferation obligations.²² Resolution 1835, however, also reflected divergence in the way the various Security Council members saw the “dual-track” working in the future. Internal differences have diluted the Council’s ability to implement the agreed strategy.

China and Russia, while recognizing the need to get reliable guarantees of **the exclusively peaceful nature of Iran’s nuclear program** and to strengthen the NPT regime, have emphasized addressing the problems posed by the INP through diplomatic engagement and measures based on positive incentives rather than coercion

and punishment. They perceive sanctions as measures that should be commensurate with the risks to the NPT regime. At the same time, China has close economic ties with Iran and depends on it as a source of energy resources. This circumstance has left its imprint on Beijing's stance on the INP.

France, Germany, Great Britain, and the other members of the European Union act basically within the dual-track **framework** but appear to be more willing to continue along the path of applying pressure.

The nonaligned, non-permanent members of the UN Security Council (Brazil, Nigeria, and others) have taken a cautious stand on using sanctions as a tool to influence Iran's nuclear policies. They consider "positive incentives" as the most important instrument for securing Iran's compliance with the NPT.

As for the United States, the Republican administration of George W. Bush pursued a policy of isolating, pressuring, and penalizing Iran, engaging in essentially no contact with Iran over its nuclear program. Furthermore, under the Bush administration's approach, **the matter of strengthening the NPT regime was relegated to a secondary position with respect to the broader aims unrelated to nuclear nonproliferation** ("democracy promotion," "regime change" by force, etc.). In 2009, the administration of President Barack Obama announced a new approach to Iran that included a willingness to hold open negotiations with Iranian leaders without prior conditions **and an active use of the tool of diplomatic negotiation to address the Iranian nuclear program.**

In 2009, Tehran missed the opportunity to rebuild trust with regard to its nuclear program by essentially torpedoing the IAEA proposal providing for shipping Iranian low-enriched uranium (LEU) out of the country for its enrichment and processing into fuel needed for the Tehran Nuclear Research Center to produce medical radioisotopes.²³

The IAEA Board of Governors' resolution of November 27, 2009 (the first such resolution since February 2006), expressed serious concern about the continuing Iranian defiance of the requirements and obligations contained in the relevant IAEA and UNSC resolutions, as well as the fact that Iran had neither implemented the IAEA Additional Protocol nor cooperated with the Agency in connection with the remaining issues of concern that needed to be elucidated in order to **preclude the possibility of an increased military dimen-**

sion of the INP. The Board of Governors urged Iran to meet its obligations fully and without delay under the appropriate UNSC resolutions and to comply with the demands of the Board of Governors by immediately suspending construction of its second enrichment facility (near the city of Qom). The Board of Governors requested the IAEA director general to send Iran's case to the UNSC. The resolution passed by 25 votes, having been supported by all of the P5 + 1 countries. There were only three votes against the resolution: Cuba, Malaysia, and Venezuela.²⁴

Tehran defied the IAEA Board of Governors' resolution. On November 29, the Iranian government announced that it had decided to build 10 new uranium enrichment plants and that the construction work on five of them would start within two months. Several Iranian parliamentarians called for cutting off cooperation with the IAEA and ending access to Iran's nuclear facilities for the international inspectors; some even threatened withdrawal from the NPT. Such politically irresponsible declarations and actions were perceived by many in other countries, including Russia, as blackmail of the international community that exacerbated suspicions with regard to Iran's nuclear policy and accentuated the urgency of additional sanctions. The new deterioration in the situation surrounding the INP was a test of the UNSC nonproliferation enforcement system.

In order for the UN sanctions to have success with respect to the INP, it is extremely important that the UNSC members, particularly its permanent members, continue to operate with a unity of purpose, ensure broad international support of the UN sanctions, and refrain from separate actions, especially if Iran should ever step across the "red line" and push toward the military use of nuclear materials (by producing weapons-grade nuclear materials, preventing the IAEA from performing its safeguard functions, or announcing withdrawal from the NPT), in which case the Security Council must stand ready to implement additional, tougher enforcement measures under Chapter VII of the UN Charter.

The sanctions that the Security Council has imposed have had an impact only on a small portion of Iran's economic activities. None of the following, for example, have been applied: broad financial constraints; a full embargo on shipments of arms; significant restrictions on investment and trade (particularly in the oil and gas sector or insurance); or other measures to which the Iranian economy would be particularly vulnerable.

The key objective is to improve the effectiveness of the sanctions regime and to ensure strict compliance. A satisfactory resolution to the Iranian nuclear problem could be found by following a course that would allow Iran to retain the capacity for uranium enrichment that it has already **achieved, in combination with extremely intrusive** verification by the IAEA.

The Sanctions Regime Against North Korea

The UN Security Council was late in responding compellingly to North Korea's violations of the NPT regime.²⁵ Pyongyang had given notice of its withdrawal from the NPT in 2003;²⁶ by early 2005, North Korean authorities announced that North Korea had a nuclear weapon. **Nuclear weapons proliferation had become a reality**, but the lack of consensus among the great powers in 2003 prevented the UN Security Council from taking enforcement measures against the proliferating state.

The supporters of the NPT then attempted to achieve a shutdown of the North Korean nuclear weapons program by using the tool of diplomatic negotiation. A special negotiating mechanism, the Six-Party Talks, was established in 2003 with the participation of China, Japan, North Korea, Russia, South Korea, and the United States. However, the negotiations were not backed by sufficiently strong enforcement measures, and stalled.²⁷

On July 5, 2006, Pyongyang carried out multiple ballistic missile tests, and on October 6, 2006, tested a nuclear explosive device. On July 25, 2006, the UN Security Council adopted Resolution 1695, ordering North Korea to suspend all activities related to its ballistic missile program and strongly urging North Korea to abandon all nuclear weapon development programs and return to the Six-Party Talks, the NPT, and the IAEA safeguards.

Following the North Korean test of a nuclear explosive device, the UN Security Council took new steps to bring Pyongyang back to the NPT regime. Resolution 1718, adopted unanimously on October 14, 2006,²⁸ established a new sanctions regime for North Korea stating that the actions of North Korea constituted "a clear threat to international peace and security" and jeopardized peace, stability, and security in the region and beyond. However, the reference to Chapter VII of the UN Charter was confined to Article 41, which stipulated

non-military enforcement measures (economic, financial, diplomatic, political, etc.). The Security Council urged the North Korean leadership to refrain from conducting any further nuclear tests or ballistic missile launches, and renounce completely all nuclear weapons and existing ballistic missile development programs.

The Security Council urged all UN member states to act to prevent the direct or indirect shipment, sale, and transfer to North Korea of any materials, equipment, goods, and technologies that could be used in the North Korean WMD programs. The Resolution also prohibited shipments of certain conventional weapons and luxury goods to North Korea and required all UN member states to freeze financial assets and economic resources designated by the Security Council as being associated with the nuclear programs of North Korea and deny entry or transit to persons (and their family members) responsible for North Korea's programs to develop WMDs and their means of delivery.

In addition, the UN Security Council called on all member states to take cooperative action (including, if necessary, inspections of cargoes to/from North Korea) to interdict illicit trade in nuclear, chemical, and biological weapons, their delivery means, and related materials. The provision in the resolution regarding the inspections of ships and aircraft suspected in participating in the transport of prohibited cargoes was formulated in the form of a recommendation to the member states (the states were "called upon") rather than a legally binding obligation.

Under UNSCR 1718, a special Security Council Committee (the Sanctions Committee) was established to oversee the implementation of the sanctions regime and define additional lists of goods, materials, equipment, and technology, the delivery of which to North Korea was to be banned. The Security Council resolved to continue taking active steps to enforce North Korea's compliance with Resolution 1718.²⁹

On April 5, 2009, North Korea tested a long-range missile under the pretext of launching a communications satellite. The President of the UN Security Council issued a statement on April 13 urging Pyongyang to refrain from further launches and comply with UNSCR 1718.

North Korean authorities defied this statement by withdrawing from the Six-Party Talks on the denuclearization of the Korean Peninsula. On May 25, North Korea carried out a second nuclear weapon test.

On June 12, the Security Council responded to North Korea's provocative behavior by unanimously adopting Resolution 1874 (based upon Article 41 of Chapter VII of the UN Charter).³⁰ The provisions of this Resolution amplified the sanctions regime substantially: the arms embargo was tightened, with complete prohibition of North Korean exports of weapons of any kind, as well as of imports of weapons into that country (with the exception of small arms and light weaponry). At the same time, the Security Council appealed to all nations to "exercise vigilance" over the supply of small arms and light weaponry to North Korea, and to notify the Committee on Sanctions at least five days in advance of such transfers.³¹

The Expanded Inspection Regime. Resolution 1874 called upon states to carry out inspections of any cargo within their borders destined for or originating in North Korea if they have reasonable grounds to suspect that the cargo contains prohibited items, as well as to inspect vessels on the high seas with the consent of the flag state. If the flag state refuses to grant consent for such an inspection on the high seas, it should direct its vessel to an appropriate and convenient port for inspection by local authorities. Under the resolution, states involved are authorized to seize and confiscate banned cargo.

The sanction regime was reinforced significantly. Resolution 1874 urged member states specifically to prohibit the provision of bunkering services (fuel, water, etc.) to vessels suspected of carrying banned cargo (except when provision of such services is required for humanitarian reasons).

These restrictive measures were supplemented by new transparency requirements: any state that conducts inspections or seizes and confiscates prohibited cargo is mandated to promptly report all relevant details to the Sanctions Committee.

Additional Financial Measures. Under Resolution 1718, only the assets of private individuals and legal entities designated by the Sanctions Committee were to be frozen. Security Council Resolution 1874 called upon member states to prevent the transfer of any financial or other assets or resources that could contribute to North Korea's nuclear activities or programs related to the development of ballistic missiles or other types of WMDs even in the absence of an explicit Committee order.

The Sanctions Committee. UN member states are mandated to submit reports to the UNSC (through the 1718 Committee)

on the steps they have taken to implement the sanctions. By June 22, 2009, 70 states and the European Union had submitted such reports.

From the standpoint of the actual enforcement technique, of special interest is the panel of up to seven experts that the Security Council established (initially for a period of one year) under the Sanctions Committee for the purpose of examining and analyzing information requested from the countries, the relevant UN agencies, and other interested parties on the implementation of the sanctions (in particular with respect to instances of non-compliance); issuing recommendations intended to improve the effectiveness of the enforcement regime; and reporting to the Security Council.

The restrictive measures described above go substantially further than the UNSC sanctions imposed on Iran, in that they provide for an essentially complete arms embargo and a prohibition of missile launches, bunkering services, and the import of luxury goods.

So far, however, the enforcement formats have not proven sufficient to change the minds of the North Korean leadership, which has persisted in developing the country's military nuclear capabilities, citing national security concerns. In September 2009, the government of North Korea announced that it was engaged in uranium enrichment activities (in addition to its efforts to produce weapons-grade plutonium). Experts believe that North Korea could now have as many as five or six nuclear explosive devices.

Strict observance of the enhanced sanctions against North Korea by the states of the world community would complicate its efforts to develop nuclear munitions, missiles, and other weapons and fund the respective programs. In addition, it would raise the barrier against "secondary proliferation" (i.e., the transfer by North Korea of sensitive nuclear or missile materials, technology, etc., to other proliferating states). The NPT community should continue to respond with one voice, to work vigorously to ensure that the UN sanctions are implemented, and to consider what more can be done in this important area.

The measures taken by the UN Security Council are not only convincing arguments in favor of resolving the nuclear crisis on the Korean Peninsula, but also an important contribution to international counterproliferation practices.

One cannot but agree with the assessment offered by the International Commission on Nuclear Nonproliferation and Disarmament that

the only available way forward is to fully implement both incentives and disincentives (including the continuation of all current UNSC measures until North Korea's behavior changes).³²

The Proliferation Security Initiative (PSI): the Role of Informal Enforcement Arrangements

The problems of arms control and nonproliferation are becoming more complex due to the practice of **channeling materials and technologies for weapons of mass destruction through illicit trade networks made up of non-state actors (suppliers, intermediaries, transport and servicing structures, and end users)**.³³

Security Council Resolution 1540 established a legal framework for responding to the new challenge.³⁴ Adopted under Article VII of the UN Charter, the resolution called upon all states to take cooperative action to prevent illicit trafficking in nuclear, chemical, and biological weapons and their delivery means, and elaborated the principles and mechanisms for countering trafficking of WMD-related goods.

Cooperative efforts under the Proliferation Security Initiative (PSI) also play an important role in addressing this challenge.³⁵ The PSI mechanism is intended to prevent access by the proliferators to the materials and know-how necessary to create weapons of mass destruction and their means of delivery by controlling the trade routes used for proliferation and interdicting shipments of WMD-related goods.

The PSI was intended "to establish a more coordinated and effective basis through which to impede and stop shipment of WMDs, delivery systems and related material flowing to and from states and non-state actors of proliferation concern." The interdiction measures are aimed specifically at states and non-state actors that raise "proliferation concerns."

These objectives are pursued through the implementation of a set of measures, **including exchanges of information concerning suspected proliferation activity**; dedication of appropriate resources for interdiction operations; coordination among participants in interdiction efforts; and the strengthening of relevant national legislation and international law, where necessary, to support the PSI arrangement.

The PSI partnership is not an international organization. It has no charter, headquarters, chairman, or budget.

The PSI is oriented toward effecting “cooperative practical effort” by interested countries; its participants also cooperate with states that remain outside the PSI framework. Specific measures are undertaken by individual states on a mutually agreed-upon basis.

One important component of PSI activities is the training exercises relating to the interdiction of illegal shipments of WMD-related materials and equipment. As of November 2009 (the year that South Korea became a participant), there were 95 partner states in the PSI.

Russia joined the PSI on May 31, 2004, believing that the strategic goals and objectives of this partnership were on the whole consistent with its national interests. Russia has structured its cooperation under the PSI on the basis of a number of principles, such as its compatibility with the norms of international law (including international agreements on nonproliferation and export controls) and national legislation; cooperative threat assessments and the voluntary nature of decision-making; non-interference with legitimate economic, scientific, and technological cooperation; utilization of the nonproliferation potential of the UN and other international institutions and mechanisms; and unbiased treatment of any individual state. Moscow emphasizes the leading role of the UN in counterproliferation efforts.

The PSI mechanisms (such as the exchange of sensitive information and the interdiction of networks engaged in the proliferation of WMDs or their means of delivery) can be applied to prevent the penetration of WMDs and their delivery means into the territory of Russia and other countries of the former Soviet Union. The focus of Russia’s efforts in this area is to reinforce its control throughout the territory of the Russian Federation, as well as in its territorial waters and the sky above. Needless to say, Russia addresses the main issues on its own, in close cooperation with its neighbors. The National Security Strategy of the Russian Federation up to 2020 (approved on May 12, 2009) provides for close cooperation between Russia and other nations within the framework of informal, multilateral arrangements and institutions.³⁶

The PSI has increasingly been echoed in a number of international formats: it has been mentioned in relevant G8 documents; elements of the PSI have been included in UNSC resolutions; questions relating to the PSI have been discussed in the International Maritime

Organization, the International Civil Aviation Organization, and various multilateral import and export control regimes. The PSI has become an element of international nuclear practices and a widely recognized enforcement instrument to be used under specified conditions.

Much, however, remains to be done in order to achieve a qualitatively new level of cooperation between military and law enforcement agencies of the states participating in the PSI, particularly in such areas as intelligence and the prompt detection and elimination of hostile intent.

Some countries have questioned the legality of interdiction actions under the PSI, particularly involving dual-purpose items that have both civilian and WMD uses. They argue in particular that the transport of WMDs on the high seas is not directly prohibited under international law.

The International Commission on Nuclear Nonproliferation and Disarmament has called for a UN Security Council resolution that would expressly permit the seizure of WMD-related items in international waters and airspace. It has also advocated integrating the PSI into the UN system as a neutral organization to assess intelligence data, coordinate and fund activities, and make specific recommendations concerning the interdiction of suspected materials and equipment being carried to and from countries of proliferation concern.³⁷ It is conceivable that in the context of more formalized links with the UNSC, the PSI could better serve as a tool for supporting the various UN sanctions regimes, in particular, in the interests of effectively implementing the UNSC counter-proliferation resolutions on Iran and North Korea.

The Need For An Effective Enforcement Mechanism

The adoption by consensus voting of UNSCR 1887 (which indicated the need for a broad range of measures to reinforce the NPT regime) was an important development. However, further efforts are needed in this area to enter a qualitatively new level of cooperation and deter serious violations of treaty obligations.

Improvements in the UNSC enforcement operations would largely depend on achieving closer alignment of interests between the three great powers: China, Russia, and the United States.³⁸

The main lesson that the Security Council can draw from the Iranian and North Korean nuclear crises is that in situations of material non-compliance with the NPT regime the United Nations must be better prepared to intervene effectively at an early stage of a nuclear dispute to hold to account those responsible for proliferation acts. A potential violator must be given clear warning well in advance about the seriousness of the UN Security Council's intention to use its full authority and ability to undertake resolute collective action to thwart proliferation.

The measures to strengthen the enforcement system are described below. They are supposed to improve the effectiveness of the UNSC work, reinforce its deterrence potential, and, whenever necessary, ensure its ability to carry out "soft" and "hard" enforcement activities in the interest of preventing WMD proliferation. Such measures should be implemented without waiting for the agreement to be reached on the UNSC reform, which is currently under discussion in the UN.

The task is not to make the enforcement system excessively repressive, but to shape the environment that encourages the deterrence of proliferation.

UNSCR 1887 emphasizes the primary responsibility of the Security Council for addressing threats to international stability caused by situations of non-compliance of states with their non-proliferation obligations. This statement needs to be fleshed out with specific content and reinforced by the appropriate actions of the Security Council members. This task would be facilitated by agreement of UNSC members on guidelines for addressing the threats posed by nuclear proliferation and nuclear terrorism. The guidelines could be supplemented by practical arrangements intended to put potential perpetrators on notice and strengthen the mechanisms to respond to crises and emergencies that such phenomena provoke. In particular, the counterproliferation prerogatives of the Security Council must be spelled out in greater detail and backed organizationally.

It would appear useful to identify the set of measures in advance and have appropriate counterproliferation procedures in place in order to remove any illusions that a proliferator harboring military nuclear plans and engaging in adventurism would go unpunished. This arrangement should serve as an effective warning to any potential proliferator and a deterrent against proliferation.

It would be especially important to agree in advance on actions to be taken against a regime that violates the NPT while still a member and then expects to be able to withdraw from the Treaty obligations with impunity. Since the country would remain responsible for any NPT violations it committed prior to withdrawal, it would seem appropriate to spell out in advance the consequences of such violations. Indeed, the implications of UNSCR 1887 are that additional detailed arrangements should follow.

The International Commission on Nuclear Nonproliferation and Disarmament has recommended that the UNSC should severely discourage withdrawal from the NPT by making it clear that such an act would be regarded by the UNSC as a *prima facie* threat to international peace and security and would lead to the punitive consequences foreseen under Chapter VII of the UN Charter.³⁹ Such advance warning about the inevitable consequences that would follow acts of proliferation could become an important political deterrent to attempts to use nuclear materials for military purposes.

A specific step in this direction could be the adoption of a framework UNSC resolution (based on and moving forward the relevant provisions of Resolution 1887) containing specific punitive options against a proliferator who systematically defies NPT requirements and the relevant UNSC resolutions.

It would also be important to enhance the capabilities of the IAEA to investigate activities that might lead to the development of nuclear weapons. The International Commission on Nuclear Nonproliferation and Disarmament has advanced practical recommendations in this field proposing to update the Additional Protocol to Safeguards Agreements by adding to the APSA specific references to dual-use items, reporting on export denials, shorter notice period, and the right to interview specific individuals.⁴⁰

A critical challenge should be addressed, that of elaborating agreed-upon rules of engagement in situations of imminent threat from substate actors (groups of extremists, fanatics, or terrorists who have seized or are about to seize nuclear explosive devices).

In the context of promoting UN nonproliferation enforcement arrangements, it would seem pertinent to return to the Russian proposal to revitalize the UNSC Military Staff Committee (MSC) to enhance the UN's ability to address new challenges to human security. Russian Foreign Minister Sergey Lavrov drew the attention of the UN community to this issue during the 61st Session of the UN General Assembly.

Incidentally, the concluding document of the World Summit (the World Summit Outcome) at UN headquarters in September 2005 contained a request addressed to the UNSC to consider the Military Staff Committee's composition, mandate, and working methods.⁴¹ Subsequently, the question of using the potential of the MSC was raised by UN Secretary General Ban Ki-Moon who highlighted the desirability of benefiting from the MSC potential in the interests of international arms control.⁴²

The MSC could become a workable mechanism for coordinating enforcement activities (including under the NPT), both among the permanent members of the UN Security Council and its other members, and within the United Nations as a whole. The Military Staff Committee's mandate should accordingly include enforcing compliance with nonproliferation obligations. The MSC may develop specific procedures to respond swiftly and effectively to the moves of potential proliferators toward the use of nuclear materials for military purposes.

The MSC could be of special importance in setting up prompt and productive communication between the UN Security Council and such international counterproliferation organizations as the Proliferation Security Initiative (PSI) and the Global Initiative to Combat Nuclear Terrorism (GICNT), **thus strengthening these international partnerships.**⁴³ The MSC would also be well placed to provide the UNSC with the necessary expertise on "hard security" issues: early warning, operational planning, and logistical support of counter-proliferation operations.

It would also be logical (should the need arise) to assign the MSC the responsibility of working out a mechanism for control over the nuclear and missile capabilities of proliferators who pose a **threat to international peace and security, or of preparing proposals to counter the threat of nuclear terrorism at sea through the establishment of special operational units under the aegis of the UN to combat this evil in hazardous regions.**⁴⁴

An infusion of energy and a sense of purpose into the UNSC Military Staff Committee and other UN enforcement instruments would be of significant benefit, **in that it would create the conditions for effective deterrence of proliferation and would enhance the credibility of the UN institutions dealing with issues of compliance, enforcement and implementation of international arms control and disarmament treaties.**

NOTES

- 1 There are currently 436 nuclear power plants (NPP) operating in the world. The World Nuclear Association predicts that their number will grow to 800 by 2030. 30 nations that have no such capabilities today seriously aspire to build nuclear power plants, which will also increase the amount of nuclear material available for dangerous use. See: *Eliminating Nuclear Threats: a Practical Agenda for Global Policymakers* (Canberra / Tokyo: International Commission on Nuclear Nonproliferation and Disarmament, November 2009), P. 48.
- 2 There are 190 member states in the NPT. North Korea announced its withdrawal from the NPT in 2003. However, this announcement has not been accepted by many states at face value, and its status remains unclear. The NPT is a cornerstone of the global nonproliferation regime and the process of international nuclear disarmament.
- 3 The IAEA Board of Governors consists of 35 member states; there are 151 member states in the Agency itself. The IAEA Statute (Article III and Article XII) authorizes **it to notify the UN Security Council of activities** that fall within the Council's competence, particularly instances of safeguards agreement violations and the diversion of nuclear materials **to non-declared purposes. The Board of Governors holds five regular sessions** per year. Monitoring compliance with nonproliferation obligations is the primary task of the IAEA. The IAEA safeguards are essential for deterring the use of nuclear materials for military purposes by providing early warning of the diversion of nuclear materials.
- 4 The prerogatives of the UN Security Council are set out in Chapters VI, VII, VIII, and XII of the UN Charter.
- 5 According to Article 41, "The Security Council may decide what measures not involving the use of armed force are to be employed to give effect to its decisions, and it may call upon the members of the United Nations to apply such measures. These may include complete or partial interruption of economic relations and of rail, sea, air, postal, telegraphic, radio, and other means of communication, and the severance of diplomatic relations." The list of measures listed in Article 41 is not exhaustive. Additional measures may be applied under Article 41, provided they do not involve the use of armed force.
- 6 According to Article 42, "Should the Security Council consider that measures provided for in Article 41 would be inadequate or have proved to be inadequate, it may take such action by air, sea, or land force as may be necessary to maintain or restore international peace and security. Such actions may include demonstrations, blockade, and other operations by air, sea or land forces of members of the United Nations."
- 7 UN Document S/PV.3046, Jan. 31, 1992.

- 8 UN Document S/RES/1887 (2009). Sept. 24, 2009.
- 9 The NPT established the international legal standard of applying IAEA safeguards “to all source or special fissionable material in all peaceful nuclear activities” within the territory of non-nuclear-weapon NPT member states, **under their jurisdiction, or carried out under their control anywhere**. IAEA safeguards are intended to monitor a nation’s compliance with its obligation not to divert nuclear materials to weapons (Article III). The IAEA is to **provide timely warning of diversion to enable the international community to intervene**.
- 10 Among the nuclear activities that Iran failed to declare on a timely basis was the conversion of natural uranium into uranium hexafluoride (UF₆) for subsequent enrichment. The NPT does not prohibit its non-nuclear-weapon member states (NNWS) from having such facilities, but they must be reported to the IAEA in a timely manner and placed under its safeguards. In failing to meet this requirement, the Iranian authorities had infringed the international NPT regime. It was this act in particular that raised doubts in the international community about the exclusively peaceful nature of the INP.
- 11 Khan admitted in 2004 to having transferred “sensitive” nuclear technology and information to Iran. A subsequent investigation into his network found that a number of European companies had violated the rules of national and international nuclear export control regimes when they provided assistance to Iran. Although this network had been broken, many of Khan’s accomplices escaped punishment. Gaps still exist in the system of international nuclear export controls.
- 12 IAEA Document GOV/2006/15. The APSA is an important element of the IAEA safeguards system that **provides IAEA inspectors with unrestricted access to nuclear facilities in a state to investigate questions and inconsistencies arising from information analysis**. Although Iran signed the APSA and applied it on a “provisional” basis from December 2003, it stopped complying with its provisions in 2005.
- 13 IAEA Document GOV/2006/14.
- 14 The agreed position of the members of the UNSC on the INP was set forth in the Statement of the UNSC President of March 29, 2006 (see UN Document S/PRST/2006/15), and in UNSCR 1696 of July 31, 2006 (UN document S/RES/1696/2006), which underscored the fact that the IAEA had been unable to conclude with certainty that Iran did not have any non-declared nuclear materials, noting that the Agency had been unable to make any progress in its efforts to guarantee the absence of undeclared nuclear materials **or activities in Iran, and expressing concern** about the proliferation risk that the Iranian nuclear program posed. Resolution 1696 has been adopted under Article 40 of the UN Charter, which deals with provisional measures that the Security Council is author-

ized to take to prevent an aggravation of the situation. The Resolution urged Tehran to comply with all measures approved by the IAEA Board of Governors, **but it did not impose sanctions.** **When the issue was returned** to the UN Security Council for further attention, Tehran's non-compliance was taken into consideration in deciding upon enforcement measures.

- 15 UN Document S/RES 1737 (2006).
- 16 The sanctions are to be lifted once the IAEA Board of Governors has confirmed Iran's compliance with UNSC and IAEA demands.
- 17 UN Document. S/RES 1747 (2007).
- 18 UN Document S/RES 1803 (2008).
- 19 The Nuclear Suppliers Group (NSG) is an important part of the international export control regime **supporting the NPT.** **The NSG has elaborated** two lists of controlled items: one for nuclear exports and the other for exports of dual-purpose goods. The NSG works to improve controls over transfers of nuclear technology and itemizes the products involved in uranium enrichment and spent nuclear fuel reprocessing.
- 20 It should be pointed out that various Iranian institutions and industrial, trade, financial, transport, and other organizations attempt (**occasionally successfully**) to sidestep UN Security Council prohibitions and restrictions by **taking advantage of the channels of illegal international trade.** In 2008, for example, the customs service in Great Britain charged a number of British businessmen with illegally delivering weapons, navigation equipment, and nuclear components to Iran (see "British Dealers Supply Arms to Iran," *The Observer*, April 20, 2008.) In connection with the sanctions imposed on Iran by the UNSC, a special regulatory directive was approved in Russia: Presidential Decree No. 682 of May 5, 2008, "Measures Relating to Implementation of UN Security Council Resolution 1803 of March 3, 2008," which prohibited, *inter alia*, all state institutions, enterprises, and individuals under Russian jurisdiction from shipping any items to Iran that could be used for producing nuclear weapons or missiles.
- 21 UN Document S/RES 1835 (2008).
- 22 A special negotiating body was established for interaction with Iran made up of the permanent members of the Security Council (China, France, Great Britain, Russia, the United States) and Germany, commonly known as the Group of Six or as the P5 +1. The six nations offered Iran a real chance to emerge from international isolation. In 2008, the group sent Iran a new version of an "incentives package" that included cooperative projects in such areas as peaceful nuclear power generation, regional security, and international trade and investment in which the six nations were prepared to participate provided that

Iran complied with the UNSC resolutions listed above and most importantly suspended its work relating to uranium enrichment. Iran refused to make any concessions regarding uranium enrichment. In early April 2009, the P5 +1 proposed that Iran return to the negotiating table for the INP discussion. On September 9, Tehran passed a package of its own proposals to representatives of the six nations. A meeting took place between the representatives of the P5 +1 and Iran in Geneva on October 1, 2009, **achieving a preliminary agreement to conduct a second round of negotiations** by the end of October. However, because Iranian leadership refused to discuss the INP, the negotiations failed to make progress.

- 23 Iranian representatives tentatively agreed to this approach during negotiations with a delegation from the P5 + 1 in Geneva on October 1, 2009. Under the approach, in 2009 Iran was to ship around 1.2 tons of low-enriched uranium (about 75 percent of the country's accumulated LEU) to Russia to be enriched to a higher level (about 20 percent U-235) and subsequently converted into fuel plates in France for use in the Tehran nuclear reactor. Iranian authorities rejected this plan, insisting on a gradual nuclear materials exchange and only within their own borders. Efforts to find a mutually acceptable compromise on the IAEA proposed project for supplying fuel to the Tehran reactor failed to lead to agreement on the issue. Had it been implemented, this project would have provided a good example for future cooperation between Iran and the IAEA and would have represented a real step toward restoring the international trust in the exclusively peaceful nature of the Iranian nuclear program.
- 24 IAEA Document GOV/2009/82, Nov. 27, 2009.
- 25 The IAEA Board of Governors had informed the UN Security Council as early as 1993 about North Korea's failure to meet its obligations under the safeguards agreement between the Agency and North Korea, and the Agency's inability to check whether any diversion of nuclear materials to weapons had taken place. The UN Security Council, however, did not take action at the time to persuade North Korea to comply with the safeguards agreement. Sixteen years later, North Korea moved from having undeclared plutonium to possessing nuclear weapons.
- 26 North Korea's withdrawal announcement did not meet the requirements of Article X of the NPT. The situation that developed affected international peace and stability and thus should have been investigated by the UNSC. However, the UNSC did not address the legality and implications of North Korea's withdrawal for international security and failed to respond appropriately to the provocative actions of North Korea.
- 27 North Korea quit the Six-Party Talks in April 2009. At one time (in September 2005), Pyongyang had promised to completely renounce

nuclear weapons and dismantle its weapons program in exchange for normalized relations with Japan, South Korea, and the United States and economic assistance, but the negotiations ended in a deadlock. The North Korean leadership tried to use the negotiations to mask their actual course of pursuing the development of missiles and nuclear weapons.

- 28 United Nations Document S/RES/1718 (2006).
- 29 The Committee was established on October 14, 2006, and on June 20, 2007, it approved the guidelines for its activities. Between January 1, 2007, and July 16, 2009, the Committee issued four reports about its activities.
- 30 UN Document S/RES/1874 (2009).
- 31 Under UNSCR 1718, only certain types of conventional weapons (such as tanks, armored combat vehicles, large-caliber artillery systems, attack helicopters, etc.), items related to weapons of mass destruction and ballistic missiles were prohibited from import into or export from North Korea.
- 32 *Eliminating Nuclear Threats*, P. 183.
- 33 The world got its first real sense of the scale of this “nuclear supermarket” in 2003 with the neutralization of the illicit network led by Pakistani nuclear scientist A.Q. Khan (the services of which had been available to such customers as Iran, Libya, North Korea, and possibly others).
- 34 The resolution was unanimously adopted on April 28, 2004. UN Document S/RES/1540 (2004).
- 35 The PSI was first proposed in May 2003 by U.S. President George W. Bush.
- 36 See: <http://www.mid.ru/ns-osndoc.nsf/0e9272befa34209743256c630042d1aa/8abb3c17eb3d2626c32575b500320ae4?OpenDocument>.
- 37 *Eliminating Nuclear Threats*, P. 97.
- 38 This characterization has been offered by the authors of the International Commission on Nuclear Non-proliferation and Disarmament Report referred to above. See: *Eliminating Nuclear Threats*, P. 207.
- 39 *Ibid*, P. 90.
- 40 *Ibid*, P.252.
- 41 *2005 World Summit Outcome*, UN Document A/RES/60/1, Par. 178, Sept. 16, 2005.
- 42 Ban Ki-Moon expounded on this topic further in his October 24, 2008, address to New York’s EastWest Institute. See: <http://www.acronym.org.uk/textonly/dd/dd89/89news01.htm>.

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- 43 Under the GICNT, about 80 partner states work to expand national and collective efforts to counter the threat of nuclear terrorism. Russia and the United States are co-chairs of the GICNT.
- 44 B. Makeev, "Naval Arms Control and Countering Terrorism at Sea," in *Russia: Arms Control, Disarmament and International Security: IMEMO Supplement to the Russian Edition of the SIPRI Yearbook 2008*, compiled and edited by A. Kaliadine and A. Arbatov (Moscow, IMEMO: 2009), pp. 46-47.

Part V

**At the Junction
of Disarmament and
Nonproliferation**

CHAPTER 18

**THE DIALECTICS OF NUCLEAR
DISARMAMENT
AND NONPROLIFERATION**

Alexei Arbatov

During the years that the Republican administration was in power, the topic of nuclear disarmament was considered anathema, either as being completely utopian in the best case, or as a dangerous idea that could undermine international stability and security in the worst. The requirement under Article VI of the NPT that the nuclear powers pursue nuclear disarmament negotiations was considered a mere empty formality, since it was seen as the “God-given right” of the great powers to have nuclear weapons, and further proliferation of nuclear weapons could be dealt with through the use of force (the “counter-proliferation” concept).

Unfortunately, after raising some timid and inarticulate objections, Russia essentially went along with this line, especially since it suited the military establishment, nationalists, and conservatives in the country quite well.

In reality, however, this prolonged deadlock in the nuclear disarmament process led to the failure of attempts to reinforce the NPT and the nuclear nonproliferation regimes (as was evident in the fiasco of the NPT Review Conference of 2005). Although the approach of dealing with this issue through the use of force had some tactical success (Israel’s attack on the Syrian nuclear facility in 2008), it also led to the strategic defeat of U.S. combat operations in Iraq and of the attempts to exert pressure on the nuclear programs of Iran and North Korea.

Eventually, once the failure and clear lack of promise of the U.S. policy had been recognized, it began to change. The sign of this change was the famous article by the four influential statesmen Henry Kissinger, Sam Nunn, William Perry, and George Shultz, which favored rehabilitating the idea that negotiations between the nuclear powers and efforts of the world community aimed at preventing the proliferation of nuclear weapons should strive to attain

a final goal of nuclear disarmament.¹ In light of the policy failures of the Bush administration, this idea quickly captured the imagination of people in the United States before spreading to the rest of the world, bringing about a real renaissance in the topic of nuclear disarmament in the consciousness of the international community and expert research.

In Russia, this topic has become the subject of a bitter struggle in scientific circles and the media between the pro-nuclear majority and a minority of nuclear disarmament proponents, although the goal of nuclear disarmament was officially reaffirmed at the first summit between Presidents Medvedev and Obama in London.²

It is difficult now to imagine a world without nuclear weapons, even over the long term. Nuclear deterrence has become the normal situation for the great powers. It is integrally linked to their military and political relations and guarantees of security for their allies, and any change would meet with resistance from an enormous military, strategic, political, and psychological momentum backed by the generally accepted opinion that the fear of nuclear catastrophe has protected the world from a Third World War over the five decades since 1945.

Moreover, the opinion prevails in Russia that only nuclear weapons can guarantee its security, given its lag in general purpose forces and in advanced technical systems as well as its geostrategic vulnerability. Both conservatives and liberals have frequently and with a certain amount of bravado denounced the old official USSR propaganda position favoring nuclear disarmament; nuclear weapons are **now characterized** as a “civilizing” factor in international relations.

The idea that nuclear disarmament and nonproliferation are connected is countered by the thesis that new members and “applicants to the nuclear club” act only in their own self-interests. It is alleged that not only would the nuclear disarmament of the great powers be of no interest to them, but that it might in fact incite them to acquire nuclear weapons by giving them a chance to stand up to the Big Five.

There are, however, a number of important considerations that cast doubt upon the validity of this conventional wisdom.

New Security Threats

With the end of the Cold War and the rise of globalization and growing interdependence among the nations of the world (yet another example of which is the economic crisis), nuclear deterrence, it would seem, is becoming an anachronism. The threats it prevents no longer exist (a premeditated massive attack by a great power or their alliances against each other), **while it does not deter the actual threats of the modern age: international terrorism, proliferation of WMDs and their means of delivery, and ethnic and religious conflicts or disputes over energy or fresh water resources, to say nothing of such issues as the environment, ecology, illegal migration, epidemics, trans-border crime, and so on.**

The rehabilitation of the idea of nuclear disarmament as the final (albeit distant) goal for the policies of the leading powers has imparted a sense of purpose and consistency to such real and useful near-term efforts as the New START Treaty that has replaced START I and to even deeper cuts in the future. It would clear the way for the implementation of such treaties as the CTBT and the FMCT, two vital treaties at the nexus of nuclear disarmament and nonproliferation, and would make it realistic to include third nuclear nations and “outsiders” (India, Israel, and Pakistan) in the process in the future. Efforts to reinforce the NPT and its regimes, resolve the North Korean and Iranian nuclear issues, internationalize the nuclear fuel cycle, and ensure that strict global standards apply to the security of nuclear materials would also receive a strong boost.

It is no less important that only in the context of such a policy (and in no other way) would it be possible for Russia (or other nations) to adequately address its other military and political concerns: halting NATO’s expansion to the east, limiting strategic BMD systems and precision-guided conventional weapons, preventing an arms race in space, and so on.

By proceeding along this path, it would be possible to reduce the nuclear capabilities of these nations to minimum levels (to a few hundred or even perhaps a few dozen nuclear devices) **while simultaneously significantly enhancing international security.** It is quite possible that **the cooperation and levels of mutual trust would increase among the nations following this course to the extent that they would be able to take the final step and eliminate nuclear weap-**

ons from their armed forces altogether. These cuts would then spread to stockpiles and warehouses and eventually reach the stage of verifiable conversion and utilization of nuclear materials and technologies exclusively for peaceful purposes. The demand for such conversion is guaranteed, considering the expected growth of the global nuclear power industry.

In fact, the argument that Russia is dependent upon its nuclear arsenal appears very superficial and quite banal, simply a Russian rehash of the theses that had been advanced by Western conservatives 20 or 30 years ago. In the modern world, Russia's enormous nuclear capabilities come into political play only when military tensions with the West increase, or in the context of negotiations and agreements with the United States, which accord Moscow an exclusive position in world politics.

Such tensions, even if they do play to the favor of some circles in Russia and the United States, actually work only to the detriment of their true interests and will undermine their national and international security, especially against the backdrop of increasing new dangers that demand partnership and cooperation. Considering the size of the arsenal and the on-going modernization programs, it might be decades before any nuclear disarmament talks could succeed in scaling down the Russian nuclear deterrent capability to minimally sufficient levels; in any case, the diplomats from Moscow will be sure to make it so. The final level, given enhanced pre- and post-launch rates of survivability, might consist of only a few dozen warheads, since advanced modern countries would find the elimination of even a handful of major cities unacceptable.

Status Issues

The importance of nuclear weapons for Russia's status and security has been greatly exaggerated. Aside from the hypothetical and unlikely possibility of a massive attack by NATO or China, nuclear weapons provide no defense for Russia from the numerous small but more realistic threats, nor do they address its enormous economic and domestic political problems. It must not be forgotten that when the Warsaw Pact and the Soviet Union collapsed, they had five to seven times as many nuclear weapons as Russia does currently. Moreover, if nuclear weapons remain and their proliferation inevitably continues, Russia's

nuclear capability will be devalued and its status undermined unless it can find another basis for such status.

Finally, in order to believe that the nuclear weapons inherited from the Soviet Union are the only conceivable and attainable attribute of Russia's status as a great power, one would have to have really no faith in the Russian people.

Naturally, if Russia should renounce nuclear weapons, this must not be seen as a green light to engage in major, regional or local wars with conventional weapons or systems based upon new physical principles (laser, particle beam, seismic, etc.). In other words, a world without nuclear weapons would not at all be like today's world minus the nuclear weapons, but rather be an international community organized around different principles to assure security for all nations, regardless of size or economic or military capabilities.

The need to move toward a world order based upon cooperation is growing, and **not only because of the nuclear threat; it is becoming imperative** due to the lessons of the economic crisis and the need to cooperate to address such 21st century global problems as climate, food, demographics, etc.

Nuclear Weapons Reductions

The continued role of nuclear deterrence in relations among the great powers is probably spurring the proliferation of nuclear weapons and increasing the chance of their acquisition by terrorists, although this is a matter of debate. It is, however, an undeniable fact that relations based upon mutual nuclear deterrence have prevented the great powers from cooperating effectively to counter this threat.

Simple logic would suggest that in a multipolar globalized world, nuclear deterrence will unavoidably lead to nuclear proliferation and sooner or later will make the accidental or intentional use of nuclear weapons (or an explosive device) inevitable, either by states or by terrorists. Any such use would be disastrous for contemporary civilization, changing it fundamentally and unpredictably.

The nearly 40-year history of nuclear arms reduction negotiations provides a good basis to impartially assess the extent to which the nuclear nations have met their commitments under the first part of Article VI of the NPT. On the one hand, it can be said that the process of negotiating verifiable limits and reductions in nuclear weapons

by the main nuclear rivals, although with periodic drops in activity, generally appeared to satisfy Article VI of the NPT. On the other hand, the motivations for such negotiations and agreements had little to do with their obligations under the NPT, even if the parties occasionally cited them as proof of their observance of the NPT. Moreover, the other nuclear nations were left out of the process.

On the whole, over the two decades following the end of the Cold War and the 1991 START I agreement and through 2012, the great powers (primarily Russia and the United States) reduced **their strategic and tactical nuclear warheads** by about 80 percent, both under treaties and unilaterally.

Although the scale of the cutbacks is quite impressive, so too is the number of nuclear weapons that remain (on the order of 10,000 deployed warheads in the inventories of all nine nuclear states).³ At this stage, the prospects for future and deeper nuclear weapons reduction talks taking place after the New START are unclear.

For an **entire decade, the great powers had openly refused to continue further nuclear disarmament negotiations**, which was an unprecedented violation of Article VI of the NPT. The parties' explicit enhancement of the role these weapons played in ensuring their security and their withdrawal from several previous treaties flagrantly violated the spirit of the Treaty. The New START Treaty became an encouraging break-through in the nuclear disarmament process. However, the prospects for follow-up talks and treaties are currently quite unclear.

Motives For Nuclear Proliferation

This leads to an eternal and fundamental question: if after 1968 the United States and the Soviet Union/Russia had engaged the other three nuclear powers ("legitimized" under the NPT) in their negotiations and had conducted negotiations on limiting and reducing nuclear weapons with a greater sense of purpose, and if the cuts in nuclear weapons over the past decades had been far deeper, might this have prevented India, Israel, North Korea, Pakistan, and South Africa from developing and deploying their own nuclear weapons? Could this have precluded nuclear development programs in Iraq, Libya, and Syria, or the **alleged military plans of Iran or other countries** that might potentially follow the example of North Korea?

This question can only be answered in the form of a hypothesis. Skeptics and opponents of nuclear disarmament in Washington, Moscow, and a number of other major capitals categorically deny such an interrelation. In fact, they assert that cuts in nuclear weapons to levels of a few hundred (or even a few dozen) warheads in Britain, China, France, the Soviet Union/Russia, and the United States would only reinforce the incentive for further proliferation, making it relatively easier for the “threshold nations” to achieve the levels of nuclear weapons held by the Big Five countries.

An additional argument against nuclear disarmament is centered on the fact that the parties to the Treaty have done very little so far toward meeting their obligations under the second part of Article VI (in which the parties undertake to pursue and ultimately sign a treaty on general and complete disarmament under strict and effective international control).⁴

Advocates of the reduction and limitation of nuclear weapons have asserted to the contrary that this scenario would have had a tangible effect on nuclear nonproliferation. In particular, this argument has been raised at each and every NPT Review Conference by the majority of non-nuclear member nations, who have accused the nuclear powers of failing to meet their obligations under Article VI of the NPT.

As usual, real life is far more complicated than linear yes-no logic, and is certainly more complicated than the political stances that governments assume at international forums.

Doubtless, the factors that would impel a nation to acquire nuclear weapons are more varied and contradictory than simply wanting to follow the example of the nuclear states. The main motivations for the leadership of any nation to decide to develop nuclear weapons relate to external security issues, prestige in the world arena, domestic popularity, or eliciting concessions from other countries in exchange for renouncing or limiting their nuclear activity. The NPT does not address any of these objectives directly or effectively (for example, in the sense of offering nations more attractive rewards in these areas in exchange for their non-acquisition of nuclear weapons), nor does it present any potential serious economic or political price to pay by those nations that do not cooperate. Nor do agreements between the great powers on nuclear disarmament necessarily have a direct impact on the above-mentioned incentives.

It can be assumed with a reasonable amount of certainty that over the term of the NPT's existence, such countries as, say, Israel and South Africa have chosen the nuclear option regardless of the concepts contained in Article VI. This connection is more evident in the case of India, which aside from domestic and status-related motives for producing nuclear weapons **had also felt compelled by its apprehension over the growing military, economic, nuclear, and missile ambitions of the Chinese after it lost hope of obtaining security assistance from the Soviet Union/Russia.** Pakistan's decision to follow this example was primarily intended to oppose India, while secondarily being camouflaged by ideological justifications (the "Islamic bomb"), i.e., it had little to do with Article VI.

In considering the lessons of the "nuclear histories" of Iran and North Korea, it can be assumed that the chief motivating factor for Pyongyang in pursuing its nuclear program has been the survival of its political regime. Threatened by defeat in its economic and socio-political competition with Seoul (exacerbated by the economic sanctions imposed by the West), North Korea also took seriously the threat of U.S. military attack primarily with the use of conventional weapons. Finally, its growing political isolation also began to tell, with the country being seen as a contemptible "rogue state" in the eyes of the world community. The loss of formal and real guarantees of security from the Soviet Union and China added to reports of military nuclear experiments conducted by South Korea apparently became the final argument for North Korea in deciding to acquire nuclear weapons.

Under such circumstances, Pyongyang saw its program to develop nuclear weapons as a final guarantee of its security from an external threat, a bargaining chip to exchange for economic and political concessions from the West, and a way to enhance the regime's prestige in the world and in the eyes of its own people. It also appears likely that the bomb became a way for Kim Jong-il to reinforce his position among the elites in the military, party, and scientific and industrial sectors after his father's death. Obviously, not one of the motives cited above for North Korea's actions would have been deterred even slightly by the nuclear disarmament efforts of the United States and the Soviet Union/Russia.

As for post-Shah Iran, the motive for pursuing a nuclear program (for its potential military application) was probably fear of Iraq, which had been developing nuclear weapons and had fought a war

against Iran in the 1980s using chemical weapons and tactical missiles. Once the war ended, however, fears of the potential use of force by the United States (especially upon the Republican administration's accession to power in 2000) and by Israel (an undeclared nuclear power) took center stage, in addition to ambitions for a regional and global status and overall prestige. The latter were connected with the creation of nuclear weapons in neighboring India and Pakistan and Tehran's ever more insistent assertion that it had become the leader of the Islamic world following the defeat of the Taliban in Afghanistan and Saddam Hussein in Iraq, and in light of the instability of the regimes in Pakistan and Saudi Arabia.

In this case, too, it would appear at first glance that the nuclear disarmament efforts pursued by the United States, Russia, and other great powers under Article VI of the NPT could hardly have been expected to have any influence over the suspicious aspects of the Iranian nuclear program.

Dialectical Interdependence

Deeper analysis, however, makes the conclusion unavoidable that there really has been and continues to be a positive link between disarmament and nonproliferation (although not a direct link, but one much more intricate and subtle).

In the first place, this would derive from the general atmosphere of perceived international security under which a nation defines its attitude toward nuclear weapons, no matter what the specific or individual factors that might dictate such an attitude at any given time.

It could **hardly be considered random coincidence that serious nuclear disarmament negotiations and real nuclear weapons reduction (INF, START I, START II, the New START framework, the ABM Treaty, the CTBT, and the unilateral tactical nuclear forces cut-backs undertaken by the United States and the Soviet Union/Russia) have been paralleled by some 40 additional members that have joined the NPT, including two nuclear powers (China and France). The Treaty was indefinitely extended in 1995, and in 1997 the Additional Protocol was developed. Four nations (Argentina, Brazil, Iraq, and South Africa) abandoned military nuclear programs and nuclear weapons or had them eliminated by force from outside, while three other nations (Belarus, Kazakhstan, and Ukraine) that had been left**

with nuclear weapons within their borders following the collapse of the Soviet Union joined the NPT as non-nuclear states following two years of negotiations.

If the great powers would consistently pursue policies aimed at reducing nuclear weapon arsenals, diminishing the role such weapons play in national and international security and strengthening the global “taboo” on any direct use or threat of use of nuclear weapons, then the significance of nuclear weapons as a symbol of status, power, or prestige would most likely have correspondingly declined. Simultaneously, the domestic political popularity of nuclear weapons in many countries would also begin to fade (as, say, has been happening with the PR attractiveness of biological and, increasingly, chemical weapons).

It is equally apparent that the exact opposite approach that was taken by the great powers and the three nations that have not joined the NPT helped to establish the perfect atmosphere at the end of the 1990s for nuclear weapons to be seen as a more attractive option by leaders and public opinion alike in a growing number of nations.

The second general point is that the maintenance, upgrade, and, in some cases, expansion of the extremely high levels of nuclear forces supported by the great powers continue to be largely based upon a strategy of mutual nuclear deterrence, which continues to be the guiding principle in military policy. At the same time, however, this situation of hostile confrontation in strategic relations (in which thousands of nuclear warheads have been programmed to strike targets on the territories of other nations and missiles are kept at hair trigger launch readiness) places stringent restrictions on the ability of the great powers to engage in deeper constructive cooperative efforts. Difficulties encountered during nuclear disarmament negotiations heighten the level of mutual mistrust between them and increase the suspicions of the political elites, exacerbating the differences between their perceptions of the world’s problems.

This is already of more direct concern for nonproliferation issues, in particular those aspects dealing with sanctions against third countries or the development of a unified position during negotiations with them (the P5+1 talks with Iran and the Six-Party talks with North Korea), and especially any potential joint military operations undertaken under the PSI or against nations that have violated the IAEA safeguards agreements or intend to withdraw from the NPT without justification. No less difficult would be the establishment of a Joint

Missile Attack Warning System or a common BMD defense system (which the Russian Federation and the United States agreed to do in 1998 and 2002, respectively, and which is periodically reaffirmed in joint documents).

There are a number of areas where a more direct correlation between nuclear disarmament and nonproliferation is evident. Above all, this is true of the CTBT (which was signed in 1996 but never went into effect) and the FMCT (over which negotiations at the Conference on Disarmament in Geneva hit an impasse). **Had the important nuclear disarmament measures described above been implemented and joined by all parties to the NPT and the three “outsiders” (under pressure from the great powers), then additional barriers to further nuclear proliferation would have been established automatically.** Had the United States not withdrawn from the ABM Treaty in 2002, and had it unblocked the CTBT and the FMCT, then North Korea (and later Iran) would have had to surmount not one, but three separate “barriers” on the road to acquiring nuclear weapons: the NPT, the FMCT, and the CTBT. This would have been much more difficult and would have encountered a much more united and resolute opposition by the great powers, the UN Security Council, and the world community as a whole.

Non-compliance with Article VI has become a bone of contention between the great powers and many of the fully compliant non-nuclear members of the NPT, who view non-compliance as a violation of **the mutual understanding that had been part of the 1995 decision on the permanent extension of the Treaty and of the discussion of the 13 Practical Steps that were adopted at the NPT Review Conference.** The failure of the Review Conference in 2005 was evidence of this deep disunity. The current situation has deprived the great powers of the strong political position needed to press through comprehensive measures to reinforce the nonproliferation regime, which had been discussed in particular at the 2005 Review Conference. At issue here are such goals as to universalize the 1997 Additional Protocol; **tighten the NPT withdrawal procedures under Article X.1;** implement tougher norms and conditions of export controls through the NSG; put a halt to national NFC programs and transition to international fuel cycle centers; move the PSI into the international legal field; and so on. These are all measures that would be very difficult to force upon the non-nuclear countries participating in the NPT, which are already bearing the main burden

of limitations and control under the Treaty, while the nuclear powers grant themselves virtually complete freedom in their own military nuclear activity, both in the sense of the legal restrictions and in verification and transparency.

Another obvious consequence of the nuclear policies of the great powers that is stimulating proliferation can be quite justifiably considered to be what has up to now been the lack of any coordinated and implemented negative security assurances for the non-nuclear members of the NPT on behalf of official nuclear powers. These assurances exist only in the form of rather ambiguous individual statements by representatives of the permanent member nations of the UN Security Council in 1995, first by Russia, then the United States, Great Britain, France, and China. They pledged not to use their nuclear weapons against any other nation that participates in the NPT unless such nation has launched an armed attack under allied agreement with another nation that possesses nuclear weapons against them, their territory, armed forces, or allies, or in cases of joint operations against them by such nation with another nation that possesses nuclear weapons during or in support of an invasion or armed attack.

In 1995, these statements were summarized in UN Security Council Resolution 984, which, however, was merely a rephrased version of the similar but less detailed Resolution 255 of 1968. In fact, it contained no reference to any direct security assurances for the non-nuclear nations at all, not even in the form in which they had been expressed in the statements by the permanent members of the UN Security Council. The proposals that had been made in advance of the Geneva Conference on Disarmament in 1995 suggesting a convention that would legally formalize full-scale security assurances for non-nuclear NPT members went no further.

Quite obviously, the unconditional obligation not to use nuclear weapons first against another NPT member nation assumes a declining role for these weapons politically (perhaps even militarily and strategically) in the foreign policies of the great powers. This would clearly be in contradiction to their current approach and military programs.

Under such conditions, the non-nuclear nations that lack full-fledged security treaties with the nuclear powers and are situated in volatile regions would have a completely understandable incentive to create a nuclear capability that would allow each nation to use its own forces to provide for its own national security. This is exactly

what happened with Israel, North Korea, Pakistan, and South Africa, and in the future it will serve as an impetus for Iran and other threshold nations.

In other words, the relationship between nuclear disarmament and nonproliferation, based in particular on the experience with the cases of Iran and North Korea, can be formulated as follows:

- compliance with nuclear disarmament obligations under Article VI of the NPT is not in itself a guarantee against nuclear proliferation, which can have numerous and complex motives;
- it would require a number of additional measures to strengthen and develop the NPT, its regulations, and its mechanisms;
- however, non-compliance of nuclear nations with the obligations under Article VI all but guarantees further nuclear proliferation, and would greatly complicate efforts to reinforce the regime and the nonproliferation systems.

In that case, the only course of action remaining would be the use of force, often outside the world's established international legal framework. As the experience with the war in Iraq in 2003 demonstrated, such medicine can be worse than the disease and can lead to exactly the opposite consequences, including for nuclear nonproliferation.

Disarmament as a Goal and a Process

To picture nuclear disarmament in the modern world either as a goal or as a final state is extremely difficult. Not only would its military, strategic, technical, **and economic aspects present problems; its political nature** would be even more daunting. In fact, the liquidation of nuclear weapons and the elimination of doctrines of nuclear deterrence should not allow nations through *laissez-faire* to develop or use conventional weapons, other types of WMDs, or weapons based on new physical principles.

That means that final nuclear disarmament would imply a nearly universal and complete disarmament, which, in turn, would require a fundamental reorganization of international relations and the means for conflict and dispute resolution other than the system that has existed throughout known human history. A reorganization of this type would obviously take many decades; aside from other factors,

however, the process is also being stimulated by the processes of globalization and growing interdependence in the world, problems with the climate, energy, and demography, and many other tendencies and threats of the 21st century. Nuclear disarmament is only one aspect of this most complex historical process, **and is not so much its objective as its premise.**

Nevertheless, while as an ultimate state it is relegated to a rather distant future, nuclear disarmament is already entirely possible as a process leading to a safer world and gradually but constructively changing the foundations of the existing world order. More importantly, an entire series of measures in this sphere are essential and are urgently needed in order to enhance the current security situation for the nuclear and non-nuclear powers and to reinforce the regime and the system of nuclear nonproliferation in the world.

NOTES

- 1 G.P. Shultz, W.J. Perry, H.A. Kissinger, and S. Nunn, "A World Free of Nuclear Weapons," *Wall Street Journal*, Jan. 4, 2007, P. A15.
- 2 *Joint Statement of President D. A. Medvedev of the Russian Federation and President B. Obama of the United States of America Regarding Negotiations on Further Reductions in Strategic Offensive Arms* (London, April 1, 2009), President of Russia's official website: <http://www.kremlin.ru/text/docs/2009/04/214589.shtml>.
- 3 *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers: Report and Research Papers*, ed. G. Evans and Y. Kawaguchi (Canberra: 2009), <http://www.icnnd.org/reference/reports/ent/downloads.html>.
- 4 A number of treaties, however, have indeed been concluded on other types of WMDs, as well as the 1990 CFE Treaty and other regional treaties establishing nuclear-free zones and limits on conventional weapons, and a series of confidence-building measures and agreements on anti-personnel landmines, etc. Such measures, however, have all been of a limited nature both with respect to their specific subjects and in their geographic scope, and they have never been incorporated into any comprehensive program of general and complete disarmament. Moreover, the continuing buildup of conventional forces and weapons, the extensive global arms trade, and the development of fundamentally new systems of weapons could hardly be seen as evidence that the nations of the world are moving toward this goal, which has since disappeared even from the lexicon of official international documents.

CHAPTER 19

SECURITY ASSURANCES

Alexei Arbatov

In contemporary international politics, the security guarantees given by some countries with regard to others are usually subdivided into either “positive” or “negative.” The former means that they have agreed in multilateral or bilateral treaties to defend each other if either comes under attack. Such guarantees are usually extended under military and political alliances (NATO, United States-Japan, United States-South Korea, Collective Security Treaty Organization, the Warsaw Pact in the past, etc.). Among other things, they usually presume an obligation to use nuclear weapons for such purposes (along with other means), and are sometimes accompanied by a deployment of nuclear weapons to the allied countries to enhance credibility.

By contrast, “negative” security assurances imply the obligation to refrain from using force, including nuclear weapons, against other nations (with certain qualifications and exceptions).

Security Assurances and the NPT

Clearly, the maximum possible political reinforcement for the NPT would be for the nuclear powers to offer non-nuclear states positive security guarantees, which would give the latter the strongest incentive not to acquire nuclear arms. It is also clear, however, that in the current international situation the nuclear powers would not be able to extend such all-encompassing obligations; besides, they themselves are not even allies (with the exception of France, Great Britain, and the United States). The predominant majority of the 180-plus non-nuclear NPT member nations are not allied with the nuclear powers and in this sense remain either neutral or nonaligned. At the same time, following the massive influx of new countries that joined the Treaty in the 1990s, all of the non-nuclear states are now Treaty members.

The question of offering such nations negative security assurances has been raised at every NPT Review Conference and Preparatory Committee meeting. At the very beginning, immediately after the signing of the NPT in 1968, the UN Security Council adopted Resolution 255, which contained assurances in very general terms that the security of the non-nuclear NPT member nations would be ensured and recommended that the nuclear NPT member nations offer negative security assurances to the non-nuclear states. The UN General Assembly **has been adopting standard resolutions on negative** assurances every year since 1978.

With the Treaty extended indefinitely at the 1995 NPT Review Conference, the five permanent members of the UN Security Council, which once China and France **had also joined the Treaty had all become** “legitimate” nuclear powers (under Article IX.3), made standard statements promising not to use nuclear weapons against non-nuclear NPT member nations. At the same time, however, all of them (except China) released a number of significant qualifications, which may be presented as follows:

- the guarantees applied only to NPT member nations;
- they applied only to the non-nuclear nations of the NPT;
- the obligation did not cover allies of the nuclear powers;
- they did not apply to non-nuclear states engaged in joint military operations with a nuclear power against the nation extending the obligation;
- the guarantees did not cover any non-nuclear nations that commit an act of aggression against the **nation, its allies, or its armed forces, while allied with another nuclear power.**

These exceptions to the promise not to be the first to use nuclear weapons can be explained by quite specific strategic and operational considerations on the part of the great powers and their predicted scenarios for the potential development of wars or armed conflicts. Still, qualifications of this sort essentially strip such obligations of any substance. Rather than reducing the political and military roles of nuclear weapons by diminishing the likelihood of their use, such **guarantees “with exceptions” have only increased the importance** of such weapons in the military policies and military planning of the nuclear NPT members, which in turn has indirectly induced non-nuclear nations to acquire such **weapons and weakened the non-proliferation regime.**

Nevertheless, in 1995 the UN Security Council summarized these declarations and adopted Resolution 984, which advanced negative security assurances for non-nuclear nations with all of the above-mentioned **qualifications**. **As it prepared for the permanent extension** of the Treaty, the NPT Review Conference favored offering the non-nuclear nations additional security assurances, in particular discussing **the possibility of requiring the signing of a legally binding** international convention on such assurances. Although Great Britain and Russia supported this initiative, other nuclear states refused to join them.

The NPT Review Conference of 2000 **advocated legally binding** negative assurances and included them indirectly in its well-known 13 Practical Steps (Step 9: “a diminishing role for nuclear weapons in security policies”). The following Review Conference of 2005, which ended as a **complete fiasco due to the destructive policies of the Republican leadership in the United States**, left this issue unaddressed, along with others. The U.S. position was expressed in February 2002, when then Under Secretary of State John Bolton labeled negative assurance as “theoretical assertions that other administrations have made.”¹

Still, the idea of using such assurances to reduce the role of nuclear weapons and strengthen the NPT did not fade, surviving the inglorious departure of the Republican administration. The international Weapons of Mass Destruction Commission, which was chaired by internationally renowned diplomat Hans Blix, **said in its 2006 report**: “The nuclear-weapon states parties to the Non-Proliferation Treaty should provide legally binding negative security assurances to nonnuclear-weapon states parties. The states not party to the Non-Proliferation Treaty that possess nuclear weapons should separately provide such assurances.”²

Following the Blix Commission, the International Commission on Nuclear Non-proliferation and Disarmament was formed at the initiative of Australia and Japan and chaired by Gareth Evans and Yoriko Kawaguchi, formerly the foreign ministers of the two countries. **As the Commission stressed in its 2009 report**: “On doctrine, the Commission’s preferred position, pending the ultimate elimination of nuclear weapons, is that every nuclear-armed state makes a clear and unequivocal ‘no first use’ declaration, committing itself to using nuclear weapons neither preventively or preemptively against any possible nuclear adversary, keeping them available for use,

or threat of use, by way of retaliation following a nuclear strike against itself or its allies. ...This would be a declaration to the effect that ‘the sole purpose of the possession of nuclear weapons is to deter the use of such weapons against one’s own state and that of one’s allies.’”³

The resurgence of the idea of nuclear disarmament that began following the well-known article by four authoritative American public figures⁴ returned the matter of no first use of nuclear weapons to the logical forefront in international debate.

Of course, government declarations concerning against whom and under what conditions they would be prepared to use nuclear weapons do not necessarily correspond to actual operational plans or **the military or technical capabilities to carry them out. For example**, the commitment that the Soviet Union made in 1982 not to use nuclear weapons first was met with skepticism outside the Warsaw Pact and the circle of countries partnering with the Soviet Union; in exactly the same way, similar official declarations now made by China have been subject to the skepticism of the world community (see Chapter 2).

Nevertheless, these official political positions of the great powers are of major significance, since they identify the place that these nations allocate to nuclear weapons in providing for their national security and ability to defend themselves, as well as the role these weapons play in maintaining their national status and international prestige.

This has all exerted a significant influence on the way the non-nuclear nations view the potential for their acquisition or renunciation of nuclear weapons, and also indirectly on strategic stability (since it involves the likelihood or capability of making a first nuclear strike) and the prospects for nuclear disarmament and progress toward a world free of nuclear weapons (in accordance with Article VI of the NPT).

Prohibition of Nuclear Weapons and Measures to Outlaw Them

The most radical approach (which the most liberal and pacifist circles in the world community advocate) would be to negotiate an international convention to prohibit and outlaw nuclear weapons, analogous to the Biological and Toxin Weapons Convention (BTWC), which prohibits the development, production, stockpiling, **and use of bacte-**

riological (biological) or toxin weapons and requires their elimination, and to the Chemical Weapons Convention (CWC), which prohibits the development, production, stockpiling, or use of chemical weapons (i.e., even in response to an attack), prohibits their possession and requires their elimination. Over the long term, the general plan was eventually to eliminate chemical weapons arsenals.

The idea of declaring nuclear weapons illegal implies the prohibition of the use of such weapons in any capacity (i.e., to carry out a first, preventive, preemptive, or retaliatory strike) and the obligation not to develop, test, deploy, and possess nuclear weapons in any way, as well as the promise to eliminate stockpiles of such weapons either under international treaties or unilaterally. Some of these obligations are contained in Article VI of the NPT for the nuclear powers and Article II for the non-nuclear states, although these articles do not include conditions for the renunciation of the use of nuclear weapons.

There has been no comprehensive treaty to eliminate nuclear weapons similar to the BTWC or the CWC. None of the previous, current, or upcoming treaties dealing with nuclear weapons provide anything beyond partial measures to reduce or limit nuclear weapons (although some treaties, such as the CTBT and treaties prohibiting the placement of nuclear weapons in outer space or other environments, are broad in scope). With national arsenals continuing to be stocked with nuclear weapons, it would be purely symbolic and essentially pointless to declare either their possession or their use illegal.

So long as nuclear weapons remain available to other nations, no nuclear power would ever renounce their use, at least as a means for retaliation. The instant destructive power of nuclear weapons is so great that, from the nuclear powers' perspective, no guarantees of security under international law could ever compete with the possibility of nuclear retaliation as a main military-technical guarantee of security. This approach has been embodied in the doctrine of nuclear deterrence in all of its various versions and particular features with respect to individual countries.

Thus, so as long as nuclear weapons exist, any declaration that they are "illegal" would realistically imply only a promise not to be the first to use them (No First Use [NFU]). If this commitment were faithfully observed by all of the nuclear nations, it would essentially exclude the premeditated use of nuclear weapons, i.e., would make nuclear war impossible and in a sense illegal. The prevention of the accidental or unsanctioned use of nuclear weapons would be the subject of separate

agreements and administrative and technical measures. Even these, however, would be much easier to implement if governments would adopt the obligation of NFU of nuclear weapons.⁵

In many respects, NFU would also be conducive to concluding more radical nuclear disarmament agreements, since planning of a first (counterforce) strike generally requires the maintenance of greater forces, as does the desire to ensure a second strike capability by having enough missiles survive the attack. It would also reinforce the NPT, displaying the commitment of these nations to reducing the role these weapons play in military policy.

However, the idea of NFU is still far from becoming reality. The main problem is that it appealed primarily to the moral side of the issue without relating to the **specific military, strategic, or technical aspects**, which are what prevents this obligation from being accepted without (or nearly without) reservation. Some of the more significant and tangible strategic obstacles to NFU are examined below, as are their potential solutions.

Versions of the Pledge of No First Use of Nuclear Weapons

It will clearly be impossible to achieve further progress in nuclear disarmament or to strengthen the nonproliferation regime without reducing the role nuclear weapons play in national military and foreign policies, and this would above all imply renunciation of the most aggressive and dangerous use of such weapons, their use in a first strike.

Considering the issue from a strategic perspective, it is apparent that there are several versions of the no-first-use pledge. Moving in order from the broadest to the narrowest focus, they can be summarized as follows:

- No first use of nuclear weapons against any other nation (as declared by China and the Soviet Union/Russia between 1982 and 1993).
- No use against NPT member nations (by China).
- No use against only the non-nuclear NPT member nations (by China), retaining the possibility of launching a first strike against nuclear Treaty member nations. This qualification has been made by France, Great Britain, Russia, and the United States.

- No use against non-nuclear NPT member nations unless there are foreign nuclear weapons stationed on their soil (such as Belgium, Germany, Italy, the Netherlands, and Turkey).
- No use against non-nuclear NPT member nations unless they are allied to nuclear powers (such as the NATO countries, Japan, South Korea, and the countries of the CIS and the Collective Security Treaty Organization). Again, this qualification has been made by France, Great Britain, Russia, and the United States.
- No use against non-nuclear NPT member nations aside from the categories mentioned above and countries that could join with a nuclear country to carry out armed aggression. Once again, France, Great Britain, Russia, and the United States have made this qualification.
- No use against non-nuclear NPT member nations aside from those mentioned above and countries that possess chemical or biological weapons (this adds to the list of exceptions those from among the 55 states that are not party to the CWC and the BTWC and have not been covered by previous qualifications). France, Great Britain, India, Russia, and the United States have also made this qualification.

By comparing the strategic doctrines of nations that allow the first use of nuclear weapons under certain circumstances with the various versions of NFU presented above, the issue of pledging no first use of nuclear weapons can be examined in greater depth.

The Allies of the Nuclear Powers and the Imbalance in Conventional Forces

The unwillingness of the nuclear powers to make a categorical NFU commitment with regard to all non-nuclear NPT countries (which would be an important step toward reinforcing the nonproliferation regimes and has also been demanded by the non-nuclear nations at every NPT Review Conference) can be explained by quite serious strategic considerations.

The problem is that some of these non-nuclear nations are in fact allied to other nuclear powers, do have foreign military bases and facilities (including nuclear arms) within their borders, and could theo-

retically join an act of aggression with the use of nuclear weapons. It is apprehension with regard to the possibility of such an attack that has caused other nuclear powers to include sites within the borders of a country belonging to this category as targets for a nuclear strike in the context of their deterrence strategy, and to plan for the use of nuclear weapons (including for a first strike) in the event of a large-scale or regional war.

In this sense, the role of nuclear weapons as means for deterring nuclear aggression against one side's territory or allies through the threat of a counterstrike delivered against the nuclear aggressor and its allies can hardly be questioned within the framework of nuclear deterrence based upon counterstrike-oriented forces and planning.

At the moment, the United States alone has about 200 tactical nuclear air bombs deployed in Belgium, Germany, Italy, the Netherlands, and Turkey (Japan dropped off the list after the United States removed tactical nuclear weapons from the ships and submarines of the U.S. 7th Fleet based in Japanese ports.) The remaining NATO countries have been intensely debating the issue of ordering the removal of tactical nuclear weapons from their soil.

A withdrawal of U.S. tactical nuclear weapons from the countries mentioned above either unilaterally or under an agreement with Russia (which would be preferable in light of the accompanying verification regime) would partially remove the justification for qualifying NFU declarations to include the possibility of a nuclear strike against non-nuclear allies of a nuclear power.

In addition, the most serious issue, concerning the use of nuclear weapons to respond to an attack by general purpose forces using conventional weapons alone (in particular precision-guided long-range weapons that rely on the latest satellite information guidance systems for reconnaissance, target identification, navigation, and communication), remains unresolved.

Following the end of the Cold War, the reunification of Germany, the disbanding of the Warsaw Pact, the dissolution of the Soviet Union, and the withdrawal of Soviet combat troops from Central and Eastern Europe, the NATO countries no longer faced a threat of attack by general purpose forces, which had been considered the greatest threat to NATO throughout the forty years that followed 1945 and had been countered through nuclear deterrence and nuclear assurances of the United States, including the concept of a first use of nuclear weapons to respond to a conventional attack.

With NATO's expansion eastward, the previous superiority of the Soviet Union and the Warsaw Pact in general purpose forces was reversed to nearly the same degree of superiority of NATO over Russia and the other CSTO nations. Thus, France, Great Britain, and the United States have no further justification for qualifying their NFU declarations and their military doctrines to allow the use of nuclear weapons in response to a conventional attack.

In theory, U.S. strategy apparently still includes scenarios that provide for the possible first use of nuclear weapons in response to an attack with conventional forces and weapons against its allies in the Far East: aggression by North Korea against South Korea or China against Taiwan or (in the future) China against Japan. Still, given the low probability of such aggression, the United States has officially abandoned this policy in its latest nuclear doctrine (although it apparently made an exception for North Korea). The conventional forces of Japan, South Korea, and Taiwan are already quite strong, and are being enhanced. The fact that two of these countries are islands and that the United States has a heavy military presence based on the territories of these allied countries and in the surrounding seas must also be taken into account.

As mentioned above, China has already unequivocally committed itself to NFU. Even if such a pledge is more of a political declaration than a military operational commitment, it nevertheless has had quite a positive political impact, especially on reinforcing the NPT. In any case, the overwhelming superiority in general purpose forces that by any measure China enjoys over its neighbors (now and for the foreseeable future) allows it to fearlessly abide by this pledge in the military sense, as well.

India has also taken on a similar obligation, with a qualification applying not to conventional weapons but to other types of WMDs, which will be discussed below.

Israel (by default) and Pakistan have **focused their nuclear deterrence** strategies against a conventional force attack; however like India, they are not officially nuclear nations under the NPT, and the problem of their pledge not to use nuclear weapons first must be addressed within the framework of regional security. North Korea has neither a formal nuclear doctrine nor deployed nuclear forces; besides, this is a regional issue as well.

The main strategic difficulty in removing the qualifications under which **nuclear weapons would be used in response to an at-**

tack by conventional forces has to do with the Russian Federation. The problem has been exacerbated by the expansion of NATO to the east, the increasing superiority of the Alliance over the Russian Federation and the CSTO in conventional forces, the development of U.S. strategic precision-guided weapons systems, and the planned new BMD systems for the United States and its allies in Europe and the Far East. It must also be remembered that China, which shares a border of over 5,000 kilometers with Russia, is growing in military power (although this subject has been ignored in official Russian documents).

It does appear that the new Military Doctrine of the Russian Federation of 2010 significantly exaggerated the nature of the threat of “aerospace attack” and the expansion of NATO and its base infrastructure to the borders of Russia,⁶ at least in terms of an armed attack on Russia and its allies. The collective forces of the bloc have been reduced (by 35 percent for the ground forces, 30 percent for the naval forces, and 40 percent for the air force since the early 1990s). The 28 current members of the alliance combined have considerably fewer weapons and forces than NATO had with 16 members in the early 1990s. This would hardly be possible if the alliance were really preparing for full-scale aggression against Russia.

Although the development of long-range U.S. precision-guided conventional weapons using **space-based information systems** has definitely complicated Russian military planning, **this threat too is far-fetched** to some extent, since the potential consequences of launching an attack with advanced conventional weapons against a great nuclear power (which is what Russia is) would massively outweigh any conceivable advantage to be gained from such aggression.

Nevertheless, Russia cannot ignore the unfavorable trends evident in the global and regional balances in conventional and nuclear forces (even if they are largely due to the failures of its own military reforms over the past 15 to 17 years). The new Military Doctrine clearly emphasizes these problems of defense and security, and they should be treated as a military and strategic reality.

First of all, considering the domestic changes in Ukraine and Georgia’s territorial problems, their potential membership in NATO should be postponed indefinitely. The development of relations along the lines NATO-Russia and NATO-CSTO, especially with regard to stabilization in Afghanistan, should make any further NATO expansion to the east impossible without Russia’s consent.

Unilateral actions by the United States and its allies with respect to BMD should be replaced by a joint assessment of missile threats and by cooperation in the development and deployment of U.S.-EU-Russian BMD systems to counter such threats. The issue of limiting long-range precision-guided conventional weapons could be partially addressed under the next START agreement and at subsequent negotiations, while the remaining issues could be raised in the context of an entirely new series of agreements on arms limitation and confidence-building and cooperative measures between Russia and the United States.

In conjunction with such a “package” of solutions and agreements, Russia would be able to dispense with the issue of using nuclear weapons to respond to an attack by conventional forces and weapons, in any case, realistically, with regard to the United States and its allies.

As for the latent threat to Russia’s eastern frontier by China, a starting point might be a multilateral treaty to **limit conventional** forces and weapons within a 100-kilometer zone on both sides of the Russian-Chinese border. It would be useful to undertake additional measures to reduce the armed forces of China and Russia along their common border and expand this border zone to 200 to 300 kilometers deep in the territories of the two friendly powers. In that case, Russia could drop the conventional forces qualification from its NFU pledge as part of a package of agreements dealing with the security of its eastern border.

Responding to the Use of Other Types of WMDs

The remaining scenario deals with the potential use of nuclear weapons by a number of countries to respond to the use of other types of WMDs, as reflected in the military doctrines of France, India, Russia, and the United States (as applied to Japan).

However, the likelihood is quite low that a nuclear strike would be carried out in response to the use of chemical, bacteriological, and radiological weapons. The only nations currently not members of the CWC and the BTWC are some of the smaller countries of Asia, Africa, and Latin America, an attack by which against the nuclear powers would be difficult to imagine. The largest of the 55 nations in this category are Angola, Congo, Egypt, Iraq, Israel, Kazakhstan,

Lebanon, Myanmar, North Korea, Somalia, and Syria, of which Egypt, Israel, and Syria are included into the regional security context and are not affected by the NFU qualifications of great powers. Only North Korea presents a certain threat in this sense, to South Korea and Japan, which are reliant upon U.S. nuclear assurances (among other things) as approved in its new nuclear doctrine (i.e., an option of the first use of U.S. nuclear weapons to respond to attack) in order to deter North Korea.

Such a threat can hardly be perceived with regard to Russia and its allies. It could theoretically apply to the troops of France, Great Britain, and the United States stationed abroad, but a nuclear response on their part would hardly be likely, especially considering that NATO has powerful conventional weapons to devote in case of such a scenario.

Other types of WMDs are more likely to be used against the great powers by terrorist organizations. However, for understandable reasons, nuclear deterrence and nuclear counterstrikes will not work against terrorists, who lack any territory, economy, or regular army that could be targeted in nuclear retaliation.

It would appear that the threat of an attack by North Korea on South Korea or Japan using chemical or biological weapons can be neutralized to a significant degree by their joint air and ballistic missile defense systems with the United States, as well as by the probability of coming under massive attack with precision-guided weapons against vital civilian and military facilities throughout North Korea.

Nevertheless, even if the threat represented by other types of WMDs is taken seriously and becomes a touchy issue in relations between allies, there would still be a way to resolve the problem. For example, the four nuclear NPT member nations (France, Great Britain, Russia, and the United States) could as a first step unconditionally adopt the pledge of no first use of any type of weapons of mass destruction (which in theory could still allow them to use nuclear weapons in response to an attack by other types of WMDs). As an option, they could declare unconditionally that they would never use nuclear weapons against the non-nuclear members of the NPT, CWC, and BTWC.

Another reason for qualifying the NFU promise is to retain the possibility of delivering a preemptive disarming nuclear strike against a "threshold" nation (such as Iran or North Korea). The probability that such a strike would be launched would be extremely low, at least

involving the use of nuclear weapons. However, since the NFU commitment would by definition apply to the law-abiding NPT member nations, it would not apply to countries that have either withdrawn from the Treaty or have violated its provisions to get around IAEA safeguards. In this respect, a non-use pledge could serve as additional incentive to the non-nuclear nations to fully comply with the NPT.

Nuclear Powers

It is generally recognized that an NFU commitment may apply only to non-nuclear NPT members. This implies a right for the nuclear powers to plan preemptive or preventive nuclear strikes against each other. However, this would appear to be completely unjustified politically, destabilizing in the military and strategic sense, and counterproductive in terms of nonproliferation.

The end of the Cold War has removed any need to continue this strategy in relations among the nuclear NPT nations. Moreover, it runs counter to the understanding of strategic stability that was codified in the joint 1990 U.S.-USSR declaration (inherited by Russia after 1991). This declaration called for the two powers to reduce the possibility of a first strike in their strategic relations through START agreements (for example, by focusing on highly survivable weapons and reducing concentrations of warheads on individual carriers). These criteria did have an influence on the provisions of START I and have been reflected in the New START agreement. The five nuclear powers were pursuing the same goals in their agreements of the 1990s not to target each other with strategic weapons (although these agreements were largely symbolic).

Thus, the next step in realizing all of the measures and agreements indicated above would be the unconditional pledge of the five nuclear powers not to use nuclear weapons first against each other, i.e., no first use of nuclear weapons against any NPT member nation, without exception. Such an obligation would radically reduce the role of nuclear weapons in the military and foreign policies of the great powers and would thus help to strengthen the nonproliferation regimes. In addition, it would create favorable conditions for concluding new nuclear disarmament agreements so as to turn these commitments from mere doctrinal declarations into verifiable military and technical agreements.

Military and Technical Aspects of NFU

The United States and Russia do not have now, nor are they likely to have any time soon, an ability to carry out a disarming strike, since under any scenario either nation would retain enough weapons to deliver a destructive counterstrike against the other. The essence of maintaining strategic stability is to preserve this situation at lower force levels through new disarmament agreements. In this way, a pledge of no first use of nuclear weapons between the United States and Russia could be guaranteed in terms of strategic weapons not on words alone, but also on a military and technical basis. No conceivable U.S. BMD or air defense system could possibly alter this situation for the foreseeable future as long as Russia maintains a sufficient retaliatory potential with account taken of the U.S. nuclear counterforce capabilities.

France and Great Britain also lack a capability of carrying out a disarming strike against Russia, whether independently or jointly with the United States, while Russia for its part would also be incapable of destroying the relatively small but highly-survivable strategic forces of the two nations. Moreover, their security is also guaranteed by U.S. obligations within the NATO framework. Thus, there is a military and technical component for NFU existing at the level of strategic nuclear weapons in the context of Russian relations with France and Great Britain, as well.

In terms of Russian-Chinese strategic relations, Russia continues for the time being to enjoy a large military superiority (including a considerable counterforce capability), which it is likely to retain for at least the next decade. However, as the Chinese mobile missile forces continue to develop (and considering their intermediate range systems), the military and technical basis for a mutual NFU would also be strengthened in Russian-Chinese relations. In China's relations with France and Great Britain, a mutual obligation not to use nuclear weapons first would be a product of the fact that their territories remain beyond the reach of the greater part of the other's strategic forces.

The United States enjoys a massive nuclear advantage over China that it will retain for the foreseeable future, including significant counterforce capabilities. However, China's ability to deliver a second strike will also gradually increase, adding to the capabilities

of its intermediate-range forces to deliver retaliatory strikes against U.S. bases, armed forces, and allies in the Far East. Although this opportunity for China could be undermined by the global and regional BMD systems established by the United States and its allies, China has nevertheless not tied their limitation to its obligation not to use nuclear weapons first.

Based upon the assessments presented above, a pledge of no first use of nuclear weapons by the five great powers to one other at the level of strategic weapons would be seen as being quite valid from a military strategic and technical perspective.

As far as theater and tactical nuclear weapons are concerned, they rely upon dual-purpose delivery vehicles and are not differentiated according to their relative suitability for executing a first or second strike. However, in addressing the problems related to the imbalances in conventional forces and precision-guided-weapons capabilities, NFU commitments could be codified under a new agreement among the five great powers to **shift all TNW to centralized storage facilities**. For Russia, the fact that, according to assertions by senior military and civilian officials, all of its TNW weapons have already been moved to storage would simplify the task.⁷

Clearly, when it comes to the non-nuclear NPT nations, a nuclear NFU commitment by the nuclear powers would only be of political rather than military strategic significance, since the non-nuclear nations lack both the capability of mounting a counterstrike and the systems needed to defend themselves effectively from the nuclear powers.

Still, an unconditional commitment by the nuclear powers under the NPT not to use nuclear weapons first would considerably enhance the security of the non-nuclear nations, as well. After all, by adopting such collective (in fact, overlapping) negative security assurances, all nuclear powers would indirectly be guaranteeing the security of the non-nuclear nations should they be threatened by another state that possesses nuclear weapons.

In response to perennial demands by the non-nuclear NPT member nations and in the context of a “multi-channel” policy of reinforcing the nonproliferation regime, the five nuclear powers should without delay take on the obligation not to use nuclear weapons first against the non-nuclear NPT member nations.

Following this, the five powers should apply the NFU commitment to all of the NPT member nations, including the nuclear na-

tions. Russia, meanwhile, can make the qualification that its guarantee is based on the assumption that NATO's eastward expansion will not continue, ratification of the Adapted CFE by all the participating nations, and adoption of international legal agreements to address concerns on new long-range PGWs and the BMD systems of the United States and its allies.

NOTES

- 1 *Washington Times*, Feb. 22, 2002.
- 2 *Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms* (Stockholm: EO Grafiska, 2006), P. 73.
- 3 *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers. Report of the International Commission on Nuclear Non-proliferation and Disarmament*, G. Evans and Y. Kawaguchi Co-chairs. (Canberra: Paragon, 2009), PP. 172-173.
- 4 G.P. Shultz, W.J. Perry, H.A. Kissinger, and S. Nunn, "A World Free of Nuclear Weapons," *Wall Street Journal*, Jan. 4, 2007.
- 5 The emphasis on the guaranteed use of nuclear weapons could conflict with the prevention of unsanctioned use. For example, the requirement that submarines on combat patrol at sea must receive their missile unlock codes by radio from the command center on shore may prevent them from launching their missiles in the event of disrupted radio communication.
- 6 *The Military Doctrine of the Russian Federation*, http://news.kremlin.ru/ref_notes/461.
- 7 V. Litovkin. "Security Can Only Be Equal," *Nezavisimoe voyennoe obozrenie*, Dec. 19, 2008, P. 3; S. Ivanov, "Nuclear Disarmament: Is 'Global Zero' Possible?," *Voyenno-promyshlenny kompleks*, no. 6 (Feb. 17-23, 2010): P. 3.

CHAPTER 20

NUCLEAR TESTING

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The Goals of Nuclear Testing

Test detonations of nuclear weapons have been an integral and essential element in the process of producing and perfecting nuclear warheads since the very first models. The necessity of such testing has been dictated by the need for direct confirmation of the fact that the weapons do function and produce the desired yield. Due to the structural complexity of modern nuclear warheads, their multi-stage construction, and the **variety and rapidity of their internal processes** and their mutual interactions, mere computer or laboratory modeling is not adequate to the task. At intermediate stages of development, new designs have relied upon lower-yield tests that involve only some of the processes involved, but final confirmation has as a rule been obtained from full-scale nuclear testing. Nuclear test detonations have also been needed for other purposes, for example to confirm that a nuclear warhead could survive an accident or emergency (such as fire, free-fall, bombardment, etc.).

This does not mean, however, that it would not be possible in principle to create a functioning nuclear warhead without test detonations. It has turned out to be possible to confirm the capabilities of such relatively simple devices as the so-called “gun-type” device, for example, which was precisely the type used in the nuclear bomb dropped on Hiroshima, without preliminary testing.

It follows from the above that the need for nuclear testing will vary depending upon the objectives that a nation has set for itself once it has decided to acquire a nuclear arsenal. If it intends to take just the first few steps over the “nuclear threshold” and has enough scientific and technical expertise and the ability to carry out computer modeling and laboratory study, it could create a nuclear arsenal of limited capability without conducting nuclear testing, although

eventually even in this case it would probably be tempted to affirm its nuclear status directly (as exemplified by the nuclear weapons history of South Africa). However, for the nations planning to develop modern nuclear weapons (not to mention “new generation” weapons), full-scale test detonations become essential.

This means that a nuclear test ban would be most significant in halting qualitative development and perfection of modern nuclear weapons. Its role would be relatively less important with respect to “horizontal” proliferation, although it should not be discounted.

The First Steps

The problem of prohibiting nuclear testing has become a focus of attention primarily because of the negative environmental impact caused by nuclear explosions. These consequences, which have been particularly significant in the case of detonations at or near the earth’s surface, were increasing in seriousness as the number and explosive yield of the detonations grew. The tragic fate suffered by the crew of the small Japanese fishing vessel “Lucky Dragon” after its deck had been covered in radioactive fallout from the 15-megaton U.S. Bravo test detonation on March 1, 1954, served as a call to action for all nations to make such a ban an individual step along the broader path of nuclear arms limitation and nuclear disarmament. Appeals for its implementation were voiced by many prominent political and public figures, including Indian Prime Minister Jawaharlal Nehru, musician and doctor Albert Schweitzer, and Pope Pius XII. In 1954, India submitted an official proposal to the United Nations to ban nuclear testing, followed in 1955 by the Soviet Union. Beginning in 1956, all three nuclear powers (Great Britain, the Soviet Union, and the United States) began **trilateral discussions** of this issue as an individual step toward limiting the nuclear arms race. Negotiations on prohibiting nuclear testing took a qualitatively new turn in 1958, encouraged by the **authorization of a moratorium** on nuclear testing at the initiative of the Soviet Union.

Even during these initial negotiations, problems arose that eventually became stumbling blocks on the way to a comprehensive nuclear test ban treaty.

One of the most important problems was the verifiability of such a ban and the **selection of effective and acceptable measures of ver-**

ification. On the one hand, the level of mutual mistrust between the nuclear powers meant that verification of any agreement in this regard had to be maximally intrusive. On the other hand, it raised the suspicion (natural for such a confrontational relationship) that such measures would be used to obtain sensitive information unrelated to nuclear detonations but having significance from a national security standpoint. In particular, during the negotiations, the number of automatic seismic monitoring stations to be installed within the borders of the nuclear powers to allow detection of underground nuclear detonations and the number of on-site inspections to be conducted in cases of suspected violations of the test ban ended up being insurmountable obstacles. The Soviet Union was prepared to allow a maximum of three stations and three inspections per year, while the United States insisted on seven stations and seven inspections.

A separate problem was presented by the technical limitations of such controls. Even the substantially enhanced monitoring systems used today have a certain “threshold” limit that precludes credible detection of small nuclear detonations and identification of the precise nature of each incident detected. On-site inspections offered an additional means for detecting and thus deterring violations, but for them to be effective, each suspicious event had to be registered and its location pinpointed with reasonable accuracy, which was limited by the capabilities of the monitoring equipment.

The third problem was the absence of any ability to reliably differentiate between test detonations of nuclear weapons and nuclear detonations conducted for peaceful purposes, the idea of which at the time had quite broad support.

Behind these three rather difficult issues underlay yet perhaps the most important problem of all: the unwillingness of the nuclear powers to halt their national nuclear weapon development programs, based both on suspicions that the other side had a hidden advantage in nuclear weapons that could only be eliminated through testing, and on the outright hope of gaining an advantage in the next lap of the nuclear arms race.

These eventually forced the negotiations on full and universal prohibition of nuclear tests into a dead end. Doubtless, the flare-ups in tensions between the East and the West caused by such incidents as violations of the Soviet air space by U.S. reconnaissance aircraft, the Cuban Missile Crisis, etc., provided an additional negative influence.

The Moscow Treaty

Under such conditions, the only productive step **would be to concentrate** efforts on the simpler and more attainable objectives, which is what was done in mid-1963, when a draft Treaty to prohibit nuclear detonations in three environments (in the atmosphere, in space, and under water) was concluded after only 13 days of preliminary high-level talks and signed on August 5, 1963.

The scope of the Moscow Treaty radically improved the situation with respect to the negative environmental consequences of nuclear weapons testing. Similar in effect was the additional Treaty prohibition of all nuclear explosions capable of spreading radioactive fall-out across international borders (including the remaining types of underground explosions not otherwise prohibited), which blunted much of the criticism to which the nuclear powers had been subjected for radioactive contamination resulting from nuclear testing.

At the same time, as subsequent years demonstrated, the transition to underground testing did not prevent the nuclear powers from perfecting their nuclear arsenals by developing and testing new warheads for the multiple independently targeted reentry vehicles (the idea of which was ultimately realized after the Moscow Treaty had gone into effect), enhanced radiation nuclear weapons, etc. The problem of distinguishing between the testing of nuclear weapons and nuclear detonations conducted for peaceful purposes was also resolved, with the possibility of using the latter to carry out a number of projects that were of interest at the time (deep seismic sounding, creation of storage facilities for nuclear waste, etc.).

With no qualitative or threshold restrictions placed on underground nuclear detonations, it was quite natural for the two sides to operate without any special measures of international verification, relying instead “by default” on national means of verification.

Thus, the provisions of the Moscow Treaty represented the only option that could be implemented under the conditions existing in the 1960s. Although it turned out to be impossible to achieve a complete ban on nuclear testing, the Treaty nonetheless was a very important step, without which further progress in the process of limiting the nuclear arms race would have been unthinkable.

Initially intended for the three nuclear powers (Great Britain the Soviet Union, and the United States), the Moscow Treaty rather

quickly became one of the most universal international arms control agreements. Over 120 non-nuclear-weapon states have signed on to the Treaty; even India, Israel, and Pakistan are participants. As far as China and France (the “junior members of the nuclear club”) are concerned, while they have never assumed the obligations of the Moscow Treaty and initially began their programs using atmospheric detonations, they soon thereafter mastered their own underground testing technology and began to observe its requirements *de facto*.

One of the most important political factors behind the creation of a positive environment for further pursuit of a comprehensive nuclear test ban was the observance in good faith of the provisions of the Moscow Treaty by its participants over many years.

The Threshold Test Ban Treaties of 1974 and 1976

The next step along the way to a comprehensive test ban was taken within the framework of the bilateral limitations on underground nuclear detonations between the Soviet Union and the United States that became the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests and the 1976 Peaceful Nuclear Explosions Treaty.

The 150 kiloton ceiling for the yield of underground nuclear explosions (which had been quickly agreed upon) did not seriously impede further nuclear weapons development by either side.

Most important was that the 1974 and 1976 threshold treaties included provisions on verification and on the nature of such procedures. The initial version stipulated using primarily the seismic method of verification combined with additional information on locations of the detonation and the geological characteristics of the test site. The lack of calibration of the seismic method and a number of its other particularities, however, created a great deal of uncertainty in interpreting the data. In particular, the geological characteristics of the Semipalatinsk testing grounds (where extremely hard rock surrounds the detonation site) make the seismic signals from the explosions much stronger than those from equivalent detonations at the Nevada Test Site. Although the specialists were aware of this fact in principle, it nevertheless raised suspicions about the possibility of threshold violations. The criticism of these verification measures became so strong in the United

States that the Congress was unable to ratify the Treaties in their initial form.

Although unratified, the 1974 and 1976 treaties continued to be observed *de facto* for about 15 years before the sides were successful in reaching a mutually **acceptable solution to the verification problem** and negotiated a series of new protocols to the treaties that contained much more effective and intrusive verification measures. In particular, for nuclear warhead testing they included such measures as the exchange of information on nuclear test sites and nuclear testing programs (annually); access to test sites during site preparation; receipt of samples of rock; familiarization with the configuration of the canister emplacement point and the configuration of the nuclear explosive device canisters themselves; and verification of the explosive yield using the hydrodynamic method to measure the speed of shock wave propagation near the detonation point, which provides direct and independent data on the explosive yield of the test with far greater accuracy than the seismic method and, moreover, would actually calibrate the seismic measurements. Essentially all of these activities were conducted by the personnel of the verifying side, who were allowed the necessary access to the test site. Verification procedures adopted for peaceful underground nuclear detonations were essentially analogous.

One important aspect of the 1974 and 1976 threshold treaties was the fact that they did not provide any significant practical solution to the problem of differentiating between detonations intended for purposes of weapons development and those for peaceful purposes. Under the language eventually adopted, the only way to distinguish between them was by location: any detonation at a test site declared under the 1974 Treaty was considered to be a nuclear weapons test. Outside the test sites, however, only peaceful nuclear detonations were allowed. This purely formalistic and unverifiable approach obviously did not address the problem of preventing peaceful nuclear detonations from secretly being used for weapons purposes, but this was never actually required, inasmuch as the great powers already had equal yield thresholds and no quantitative restrictions on tests within the test sites.

Thus, by the early 1990s, the threshold treaties and their new verification protocols had combined to achieve an unprecedented level of mutual openness between the Soviet Union and the United States with respect to nuclear testing. This was true for exchanges relat-

ing to the testing programs, verification activities at the test site (both prior to and during the test), and results of the measurements. Information that had once been carefully concealed and guarded (particularly the data on explosive yield) became accessible. Before being officially adopted, the technologies used for verification were subjected to joint experimentation at test sites of both countries, both to test their suitability for use in verification operations and to confirm the continuing absence of any significant deviations from established threshold levels since the time the Treaty was signed. In the end, not only were the 1974 and 1976 Treaties ratified, but conditions that favored continued progress toward a verifiable prohibition of all nuclear testing (no matter what the yield) were also established.

The Failure of the Trilateral Negotiations

Although there had been a notable upturn in activity related to a comprehensive nuclear test ban in 1977 at the trilateral negotiations between Great Britain, the Soviet Union, and the United States, by 1980 such efforts had once again deadlocked. At first it appeared as though many of the key stumbling blocks had been on the verge of resolution. For example, in order to expedite resolution of the contradiction between the Soviet Union's desire to remove the prohibition on peaceful nuclear detonations and the lack of any acceptable way to prevent clandestine development or upgrade of nuclear warheads, it was proposed that a moratorium be declared on all nuclear explosions, to remain in effect until the appropriate verification means could be developed to prevent any kind of military benefit. In terms of the actual verification, the idea had essentially been agreed to that the verifying side would use so-called national seismic stations operating automatically within the borders of the country under verification, with the only outstanding issue being the actual number of such stations for each country. The problem of inspections performed at the site of suspicious events also appeared to be close to resolution, once Great Britain and the United States had essentially given their agreement to voluntary inspections, with the right to refuse such inspections on reasonable grounds.

Further progress, however, ceased rather abruptly. In the first place, the military and nuclear weapons developers in the United States were strongly opposed to a comprehensive nuclear test ban.

Unlike in previous years, when the main objections to the CTBT had centered on the need to continue the development of new types of nuclear munitions, the argument this time was that nuclear testing was needed in order to be certain of the reliability of existing nuclear weapons in the inventory. The reaction of the Jimmy Carter administration to such reasoning was to propose limiting the term of the CTBT. Formally, it appeared that the United States had moved closer to the Soviet position that a permanent treaty would be acceptable only if all of the five nuclear powers signed it. However, the specific timeframe proposed by the United States for the initial term of the CTBT (first five years, then three) devalued the test ban significantly. At this stage, the negotiations were set aside and the two superpowers turned instead to the more urgent (at the time) new Strategic Arms Limitation Treaty (SALT II). Then, in 1980, as a result of the general cooling in the international climate due in particular to the dispatch of the Soviet troops to Afghanistan, negotiations were broken off. Two years later, the new Reagan administration officially announced that it would not resume the trilateral negotiations, formally citing the lack of any satisfactory resolution of the verification problem. The United States had used this same justification for its refusal to submit the 1974 and 1976 threshold treaties for ratification. The situation once again was deadlocked, and if the opportunity for concluding the CTBT was not completely lost, it appeared at least to have passed well beyond the horizon.

The CTBT Becomes a Reality

Nevertheless, a number of important events and processes in the political arena gradually pushed the CTBT back onto the international agenda. The importance to the foundation of the CTBT of having found a mutually acceptable solution to the problem of verification of the 1974 and 1976 threshold treaties, as well as having achieved a degree of mutual openness, was noted above. An even greater role in this was played by the end of the Cold War and the subsequent decisive shift away from arms limitations to progressive reductions in the numbers of nuclear weapons in the arsenals of the Soviet Union and the United States, which they had begun in the late 1980s both on a negotiated legal basis and through voluntary reciprocal unilateral measures.

In the course of less than a decade, the two superpowers were able not only to halt the growth of their nuclear arsenals, but also to make radical cuts in their numbers, including eliminating delivery vehicles and launch complexes, completely dismantling nuclear munitions, and reprocessing weapons-grade fissile materials for their transfer to non-military use. All of these steps were accompanied by significant and effective confidence-building measures. The end of armed confrontation and of mutual targeting with nuclear weapons created fundamentally new conditions not only for pursuing bilateral disarmament measures, but also for engaging the other nuclear powers in the process and prompting them to review their nuclear arms policies, including their attitude to the CTBT.

An important factor in returning the test ban problem to the international agenda was the immanent expiration of the initial 25-year term of the Nuclear Non-Proliferation Treaty (NPT). The conclusion of this Treaty, which today is the most universal international agreement dealing with nuclear weapons, had only been made possible through compromise, by tying the NPT not only to nuclear disarmament on the whole but also to the CTBT in particular. It is well known that the preamble to the NPT contains a provision that underscores the commitment of the participating states to work toward a comprehensive prohibition of all nuclear weapons testing. The lack of any progress on this issue (due primarily to the nuclear powers) has always been a source of strong criticism from the other NPT participants. Such criticism intensified appreciably on the threshold of the 1995 NPT Review and Extension Conference, where the Treaty's future was to be decided. As the date of the Conference approached, a great number of non-nuclear Treaty participants began to link their support for permanent extension of the NPT to the condition that new negotiations begin on the CTBT and that real progress be achieved in this area.

That is the way things stood in early 1994, when the practical development of a Comprehensive Nuclear Test Ban Treaty was included in the agenda of the Geneva Conference on Disarmament (CD), which recreated its Ad Hoc Committee with a mandate "to negotiate intensively on a universal and multilaterally and effectively verifiable comprehensive nuclear test ban treaty, which would contribute effectively to the prevention of the proliferation of nuclear weapons in all its aspects, and the process of nuclear disarmament and therefore to the enhancement of international peace and security." It was

assumed that the main provisions of the Treaty could be negotiated as early as the spring of 1995 to expedite the permanent extension of the NPT.

The key components and primary problem areas in the future Treaty were quickly identified at the very beginning of these negotiations; the most significant of these related to the scope of its applicability and methods of implementation, including the creation of the Comprehensive Nuclear Test Ban Treaty Organization, the conditions under which it would take effect, the duration of validity, **and the conditions for withdrawing from the Treaty.** One especially complex and large group of issues related to the verification of CTBT compliance.

With regard to the scope of applicability, the problem involved identifying the specific activities to be banned under the Treaty and the **boundaries of such prohibition.** In the practical sense, this related in particular to the issue of the permissibility of peaceful nuclear detonations, which China favored, but France, Great Britain, the United States, and almost all of the non-nuclear states involved in the negotiations opposed. The arguments against allowing peaceful nuclear explosions revolved around the possible military advantage that could be concealed in such explosions, the absence of a well-reasoned verification mechanism to exclude such advantage, the danger of adverse ecological consequences from radioactive contamination, and the lack of any actual projects that would have any significant economic benefit.

Another illustration of the complexity of the problem of identifying the boundaries of the Treaty's scope of application may be seen in the position taken by some of the nations of the Non-Aligned Movement when they demanded that the ban apply not only to nuclear detonations, but also to the non-explosive weapons activity that ostensibly allowed the nuclear powers to create new types of nuclear weapons without carrying out test detonations. On the other hand, the need for the nuclear powers to maintain the reliability and safety of their existing arsenals required them to carry out corresponding activities that, at the very least, were near threshold in nature. At the initial stage, these concerns were reflected by the positions of France and Great Britain, which advocated the right of the nuclear powers to conduct full-scale testing under limited conditions. This, however, was not supported by the other members of the "nuclear club" (not to mention the non-nuclear countries), and was dropped.

Apprehension over losing confidence in the safety and reliability of their existing nuclear arsenals also figured in the various positions regarding the term of validity of the CTBT. One alternative that was offered to a permanent Treaty was for an initial term of 10 years. The United States supported this and proposed in addition that the right to make a “facilitated withdrawal” from the Treaty before the end of the ten-year term be acknowledged. Most of the participants in the negotiations strongly advocated a permanent Treaty accompanied by standard treaty language on the right for nations to withdraw from the Treaty in the event of a “threat to their greatest national interests.”

As for the conditions under which the CTBT would enter into force, several options were considered. The states discussed both a simple numerical formula, i.e., where a certain number of nations had to ratify the Treaty (along the lines of the Chemical Weapons Convention), as well as some sort of mandatory condition that the Treaty must include the five nuclear powers and the threshold nations having the capability to develop nuclear weapons (principally India, Israel, and Pakistan) before it could enter into force. An obvious objection against using a simple numerical formula was that such an approach would allow the CTBT to enter into force without the participation of any nuclear or threshold nations, thus making it meaningless in terms of both nuclear arms limitation and nonproliferation. On the other hand, formulas that included the nuclear and threshold nations would cover a broader circle of nations, but they could also leave the CTBT’s entry into force hostage to the whims of one nation or the other whose membership in the Treaty might not actually be essential.

The most complex problems concerned verification issues. Most importantly, the goal of a comprehensive, non-threshold test ban as envisioned during the negotiations was contradicted by the limitations of all of the verification technologies available (although these were significantly more advanced than they had been in the 1960s). Verification of CTBT compliance was to be global in nature, cover all environments, be **cost efficient**, and **ensure the ability to reliably detect hidden violations** and thus deter potential violators. On the other hand, it was to be politically acceptable from the point of view of minimal intrusiveness, and **not to encroach upon the legitimate security interests** of the participating nations outside of the Treaty’s scope.

As negotiations proceeded through the joint efforts of diplomats and technical experts, the outlines of an international CTBT verification regime gradually began to emerge, consisting of the following:

- the International Monitoring System (IMS) based upon four monitoring methods (hydroacoustic, infrasonic, radio-nuclide, and seismic);
- the International Data Center (IDC) to collect all of the information, process it, and pass it along to all of the member nations;
- a mechanism for consultation and clarification;
- confidence-building measures to **address large-scale chemical detonations**;
- on-site inspections of suspect events (ISE) without the right to refuse.

The last element ended up being the most difficult to negotiate, especially with respect to the acceptable justification for inspection inquiries, the mechanism for deciding to proceed with such inspection, the duration of the inspection, and the types of technology to be used, as well as the restriction of access and protection of sensitive information not related to the goals of the inspection.

The Geneva negotiations produced a much broader range of proposals on the verification methods and scope of the CTBT. India, for example, insisted on special transparency measures during verification of operations at existing nuclear test sites. This idea was rejected because it contradicted the non-discriminatory, universal nature of the CTBT, implied a kind of presumption of guilt with regard to nuclear powers, and focused control mainly on their nuclear activities. A number of non-nuclear nations (Germany, Indonesia, and Sweden) insisted that the Treaty was also intended to prohibit nuclear tests and, accordingly, that this **should be subject to verification**. The nuclear nations objected to such an approach, insisting that, in the first place, there were no criteria for identifying the point at which preparation for a test begins, and secondly, activities that resemble such preparation might have nothing to do with actual preparations and thus not imply any intention of violating the Treaty (for example, drilling shafts for geological exploration). In the third place, such expansion of the scope of verification would have further complicated the mechanisms of control (in particular by increasing the intrusiveness of on-site inspections), the goal of which would have become not only to establish that a nuclear detonation had taken place,

as currently required under the Treaty, but also to clarify the actual intent behind the events that elicited suspicion.

As a method to verify that nuclear testing was not being carried out, China, in particular, suggested including satellite surveillance and electromagnetic pulse (EMP) monitoring in the verification mechanism. However, in the end, technical experts in a majority of the countries declared such measures excessive, since their inclusion in the technologies used for the international monitoring system would have significantly increased the costs of producing and operating such a system, would have led to additional false alarms, and would not have substantially improved the capabilities of the verification system in detecting Treaty violations. Nevertheless, the final text of the Treaty did contain a provision implying the future possibility that the implementation of new technologies in the verification system, including satellite surveillance and EMP monitoring, would be allowed **once their capabilities have been studied from the standpoint of increasing the effectiveness and cost-efficiency of the CTBT verification system as a whole.**

Returning to the issue of test sites, in determining the composition and configuration of the main technical component of the international verification mechanism, it must be noted that it proved possible to successfully satisfy the so-called “equal transparency” requirement for the existing nuclear test sites to the IMS’s technical systems. The fact is that historically, during the years of nuclear testing, the Novaya Zemlya nuclear test site had been more precisely monitored by numerous seismic stations in Scandinavia having low thresholds of sensitivity that provided highly reliable data on Novaya Zemlya. By contrast, the Nevada Test Site could only be monitored with the assistance of tele-seismic devices, which combined with the geological conditions at the test site yielded **much less transparency.** These conclusions were subsequently taken into consideration, and it was decided to include into the IMS those **stations (in particular, the Maine seismic station in the United States)** that would ensure adherence to the principle of equal transparency at all test sites.

Work on the Treaty was extremely complicated, proceeding under a principle of strict consensus among dozens¹ of participants in the negotiations, the interests of which had to be scrupulously considered but at times were diametrically opposed to one another. As a result, the working draft of the Treaty that these discussions produced contained over a thousand parenthetical comments reflecting

differences in the positions of the participants. The initial intention to complete work on the CTBT by the start of the 1995 NPT Review and Extension Conference could not be met. In light of this, the final Action Plan approved by all of the participants in the Conference confirmed the intention to finish work on the CTBT by no later than 1996. This same final deadline was also established in the corresponding Resolution adopted under consensus by the UN Security Council. Such a schedule could only be met by dispensing with the slow process of addressing each of the numerous parenthetical remarks individually and replacing them with compromise versions of the text which contained **no alternative provisions, and which reflected the different national approaches evenhandedly.** This difficult step was indeed accomplished at the final stage of negotiations and ultimately proved successful. Following careful review, the draft Treaty submitted in June 1996 by CTBT Ad Hoc Committee Chair Jaap Ramaker of the Netherlands was supported by nearly all of the parties to the negotiations. If not for the special position taken by India (which wanted to tie the CTBT to a program of full nuclear disarmament within certain time limits, to expand the scope of the Treaty to include a prohibition of laboratory and computer modeling, and, most importantly, to change the conditions under which the Treaty comes into effect so as not to require India to participate), the Conference would have approved the Treaty on a consensus basis. Nevertheless, the level of support for the version proposed by Jaap Ramaker (including that of all five of the main nuclear powers) was so significant that at the initiative of a large number of its "friends," headed by Australia, the draft Treaty was approved by the 50th Session of the UN General Assembly on September 10, 1996, and opened for signature on September 24, 1996, in spite of the fact that it had never been formally approved by the Conference on Disarmament.

What, then, was contained in this final version of the Treaty, Protocol, and Annexes? Its main provisions included a prohibition on carrying out any test detonations of nuclear weapons or any other nuclear explosions in any place, as well as on inciting, encouraging, **or in any other way participating in carrying out such detonations.** The question of peaceful nuclear explosions was resolved by providing for the possibility for it to be included in the agendas of Treaty Review Conferences, but no earlier than 10 years following the Treaty's entry into force. If a consensus decision was to be reached at one of these conferences to allow peaceful nuclear detona-

tions, then the appropriate amendment precluding any military benefit from such nuclear detonations was to be added to the Treaty.

The Treaty established an international regime for its verification that included the International Monitoring System, consisting of global networks of 170 seismic, 50 infrasonic, 11 hydroacoustic, and 80 radionuclide stations, and 16 supporting radionuclide labs (a total of 337 sites), the International Data Center (IDC), and the Global Communications System linking IMS sites with the IDC, on-site inspections of suspicious events indicating a possible nuclear explosion, a mechanism for consultation and clarification, and confidence-building measures that provide for exchanges of data on large-scale detonations of conventional explosives for industry purposes. The locations and names of all monitored sites were listed in Annex 1 to the Protocol.

In order to carry out its provisions, the Treaty provided for the creation of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) in Vienna, to consist of Conferences of the member nations, an Executive Council made up of 51 countries, and a permanent Technical Secretariat headed by a director general. This Organization is to bear responsibility for the continuing functionality of the international verification regime.

The Treaty required each of its members to implement a number of national measures in fulfilling its provisions: to create or designate a national agency, adopt national laws and regulations in legal support of the main Treaty obligations, and cooperate with verification measures, including through support of the operation of the IMS facilities located within its borders, as well as willingness to host and cooperate with on-site inspections. The Treaty was to be permanent in duration, with each member nation entitled to withdraw if its supreme national interests were threatened.

The provisions of the Treaty allowed for it to enter into effect no earlier than two years after being opened to signature.² At the same time, a mandatory condition was that it was to be ratified by 44 member nations,³ including all of the nuclear powers and the three nations that had the capacity to detonate nuclear devices (India, Israel, and Pakistan). The Treaty also stipulated the creation of a Preparatory Commission to cover the period between the signing of the CTBT and its entry into force.

All of these provisions taken as a single package did in fact meet the goals that the Treaty had been intended to achieve, and repre-

sented a balanced expression of the interests of its future member states.

The Nuclear Powers and the CTBT

One of the biggest challenges facing the nuclear powers concerns their ability to maintain the reliability and security of their nuclear forces under the CTBT. The following approaches implemented by the United States and the Russian Federation are illustrative.

In parallel with work on the Treaty, the United States also developed the stockpile stewardship program, based upon scientific research and study covering a broad spectrum of profiles to address issues of routine arsenal maintenance, careful study of the problems related to aging nuclear weapons, prevention of undesirable changes by timely replacement of elements of diminished reliability, pursuit of fundamental research to deepen scientific understanding in areas relating to nuclear weapons, improvement of computer modeling capabilities through the **development of more advanced computer technology** (the Accelerated Strategic Computer Initiative) and improved calculational methodologies, and the development of more powerful laboratory modeling equipment, including in the area of inertial thermonuclear fusion.

A similar program was adopted in Russia as well. On April 19, 1996, the press secretary for the Russian president issued a statement on Russia's conditions for joining the CTBT, which emphasized in particular **that Russia, like other nuclear powers, had a special responsibility to maintain the security of its nuclear arsenal until such time as these weapons have been universally and completely eliminated, which continues to be the ultimate goal.** To achieve this under the CTBT, Russia intended to ensure that the maintenance procedures it **performed on its nuclear weapons would not contradict** the anticipated prohibitions under the future Treaty. To these ends, the following measures were to be carried out:

- Adopt and implement the Federal Program of the Russian Federation for Nuclear Weapons Safety and Reliability without detonating nuclear devices.
- Maintain existing Russian nuclear centers and implement theoretical and exploratory nuclear technological development programs in order to ensure capabilities in science

and technology and a high level of expertise among scientists, developers, and workers in these nuclear centers.

- Preserve a basic level of capability that would permit resumption of nuclear testing in the event that circumstances free the Russian Federation from constraint under the Treaty.
- Continue efforts aimed at improving the ability to monitor the nuclear test ban.
- Further improve analytical and informational capabilities, including intelligence, to provide reliable and timely information on nuclear arsenals, potential clandestine nuclear weapons development programs, **or similar activities** having significance for nuclear weapons development in other countries.

If, however, problems relating to the safe and reliable performance of the types of nuclear warheads that would be key to Russia's national security concerns could not be addressed without nuclear testing, then under the terms of the Treaty Russia reserved the right to withdraw from the Treaty for the purpose of protecting the supreme interests of the state.

The Long Road to Entry Into Force

The speed with which countries signed the CTBT over the first months following its approval by the UN General Assembly created the impression that its actual entry into force was at hand. Among the first to sign the Treaty were the five nuclear powers. By January 1997, over 140 countries had signed the CTBT, and although India (and then Pakistan) had withdrawn support for the Treaty during the final stage of negotiations at the Conference on Disarmament,⁴ it was nonetheless assumed that with such broad international support for the CTBT, they would be forced to change their position and sign on to it.

Subsequent events did not evolve according to this optimistic scenario. Neither India nor Pakistan hurried to change its position and sign the CTBT. Moreover, in May 1998, first India and then immediately thereafter Pakistan carried out a series of nuclear tests, thus expanding the "nuclear club." North Korea, the nuclear weapons ambitions of which had been "exposed to the light" as

early as 1993 when it had withdrawn from the NPT, also failed to sign it. A poorly planned Clinton administration attempt to ratify the Treaty in the Senate in 1999 was defeated. The Treaty was opposed nearly unanimously by the Republican majority in the Senate at the time, who criticized not only the actual test ban, which they said was unacceptable from the standpoint of safety and reliability of the U.S. nuclear arsenal, but also the CTBT's international verification regime, which they pronounced ineffective. When George Bush became president in 2001, his administration announced that, although the United States would continue to observe the moratorium on nuclear testing, it did not intend to ratify the CTBT any time in the foreseeable future, and thus it would not participate in Treaty activities in areas that could be required following entry of the Treaty into force, primarily related to the inspection component of the CTBT's verification regime, which the United States simply refused to fund by unilaterally withholding payment of the corresponding portion of its contribution to the annual budget of the CTBTO Preparatory Commission.

These and a number of other negative factors could not but negatively impact the efforts of the Preparatory Commission to create a verification regime and drag **the process out for much longer than the initially anticipated timeframe (3 years)**. Among these negative factors must be mentioned the worsening situation with respect to North Korea, which in 2003 withdrew from the NPT altogether and in 2006 conducted its first nuclear test detonation. Against this backdrop, despite regularly convened Conferences on Facilitating the Entry into Force of the CTBT, the process of ratification of the CTBT by the nations listed in Annex 2 first slowed, and then essentially halted.

The Comprehensive Nuclear Test Ban Treaty 15 Years On

More than 15 years have passed since the Comprehensive Nuclear Test Ban Treaty was first opened for signature on September 24, 1996. As of April, 2012, 183 states have signed the Treaty, of which 157 have also ratified it. Of the 44 countries that still must ratify the CTBT in order for it to enter into force, 36 have completed the procedure for ratification, including France, Great Britain, Indonesia, and Russia. As of now, the Treaty has not yet been rati-

fied by China, Egypt, Iran, Israel, or the United States, while India, North Korea, and Pakistan have yet to sign it.

Russia, which ratified the CTBT in 2000, is interested in having it enter into force as early as possible, **and has been pursuing multilateral and bilateral efforts to engage the countries that have not yet ratified the Treaty.** In this context, Russia advocates convening a Conference to Facilitate the Entry into Force of the CTBT (the first was held in 1999 and the last in September 2009), as provided under Article XIV of the Treaty.

Dialogue will be required with the United States at all levels, considering the fact that the first unsuccessful attempt to ratify the Treaty in the Senate in 1999 has led to delays on this matter in other countries that are crucial to the fate of the CTBT, such as China, Egypt, India, Iran, Israel, Pakistan, and North Korea.

In the case of China, ratification has been halted even though all of the preparations for ratification have been completed. Any further progress would depend upon a number of factors, including both Treaty ratification by the United States and the overall climate surrounding nonproliferation and nuclear disarmament, which China believes has been significantly degraded by U.S. efforts to create regional and global air and missile defense systems. However, it can be expected that China will ratify the Treaty once it has been ratified by the United States.

Engaging India and Pakistan in the process remains a serious problem for the CTBT. After conducting a series of nuclear tests in May 1998, the two countries declared moratoriums on further testing and at the 53rd Session of the UN General Assembly announced their intention to move forward with the CTBT.⁵ Treaty ratification by the United States would exert significant influence on the decisions of Delhi and Islamabad, but it would not be the only factor. On the whole, the signing of the CTBT must **relate to the entire set of other issues raised by the nuclear choice these countries have made, and, without doubt, to their supreme national interests.** The leaders of the two countries would be unlikely to agree to sign the CTBT without being convinced that it reflects public opinion in their respective countries.

The positions of Egypt, Iran, **and Israel with respect to ratification** are largely interrelated and in many respects subject to the overall situation in the Middle East, which continues to be quite uncertain.

In deciding whether to ratify the CTBT, Egypt will doubtless consider the views of the majority of Arab nations, all of which emphasize the importance of ensuring the universality of not only the CTBT but also the NPT (and thus regard Israel's signing of only the CTBT to be insufficient and insist that it must also join the NPT).

Israel, however, has clearly spelled out its conditions for ratifying the Treaty: first, there must be improvement in the overall situation in the Middle East, including the signing of the NPT by the countries of the region (Syria and Iraq have not yet signed); second, there must be a high level of preparedness and effectiveness on the part of the international compliance verification mechanism established under the Treaty; and third, Israel must share equal status in the functions of the regional group of the Preparatory Commission of the CTBTO. Inasmuch as it is unlikely that any of these conditions will be met within the next year or two, the likelihood that Israel will ratify the Treaty continues to appear rather remote.

In Iran, prospects for ratification have also been dependent upon the domestic political factor, as well as the overall situation in the Middle East. Although the number of advocates of social modernization in Iran has increased, conservative and religious forces continue to exert considerable influence in the *Majlis*, and it is they who have posed the CTBT ratification issue in the context of ending the country's international isolation and expressed doubt that Iran could significantly change the current state of affairs by adopting the new WMD nonproliferation obligations. Obviously, the Iranian leadership will not hasten to ratify the CTBT any time soon; it has not yet initiated practical steps to submit the CTBT to the *Majlis* for consideration. In addition, the complex situation surrounding the Iranian nuclear program (which has obviously been drawing growing international concern) can also not be ignored.

Therefore, should the current U.S. administration succeed in ratifying the CTBT, considerable forward progress in Treaty ratification by the remaining "laggards" on the list of 44 countries could be expected.

The CTBT Verification Mechanism

The significance of the CTBT is difficult to evaluate absent the compliance control regime (i.e., verification mechanism) stipulated

in the Treaty. This will be the first time in the history of multilateral arms control agreements that a global verification system has been established, with operations entrusted to an international Treaty organization. It became possible to achieve agreement on the creation of such a verification mechanism only because of the radical changes in the global situation that followed the Cold War, as well as through the necessary political will exercised on the part of all of the countries that participated in the development of the CTBT.

As noted previously, integral to the CTBT verification mechanism are the International Monitoring System (IMS) linking 321 seismic, radionuclide, infrasound, and hydroacoustic monitoring stations; 16 certified laboratories that may be used if necessary to perform in-depth analysis of radionuclide samples collected at radionuclide stations; an International Data Center (IDC) to collect, process, archive, and present data obtained from IMS sites to Treaty participants; a political and diplomatic mechanism for consulting on and clarifying suspicions of potential CTBT violations; confidence-building measures that include data exchange on large-scale conventional explosive detonations (meaning primarily industrial detonations, in particular in the mining industry); and on-site inspection of suspicious events with no right of refusal.

The Treaty stipulates that its verification mechanism must be ready for operation by the time the CTBT enters into force.

After the CTBT was opened for signature on September 24, 1996, the states that had signed the Treaty met in New York City and on November 19, 1996, adopted the document that established the Preparatory Commission of the CTBT Organization (PC CTBTO), which stated that the main goal of the Commission (to operate until the Treaty enters into force) was to establish and provisionally implement a verification mechanism. The Preparatory Commission of the CTBTO and its Provisional Technical Secretariat (PTS) formally began functioning in March 1997.

In order to evaluate the difficulty, scope, and uniqueness of the task that the Commission and the PTS have faced in establishing a verification mechanism, and to objectively evaluate the results achieved in this area up to the present time, the main components of the verification mechanism and their interactions under the CTBT must be examined in more detail.

The structure and functioning of the IMS are considered below.

The seismic component of the IMS is primarily intended for de-

tecting and identifying locations of underground nuclear detonations. It consists of a network of 50 primary and 120 auxiliary seismic stations to register seismic waves. The stations in the primary network consist mostly of so-called seismic groups, each of which can include up to 20 seismic detectors. These primary seismic stations are to transmit data to the IDC continuously and in nearly real time. **Although it was not specified in the Treaty, the assumption is that they would have to be capable of reliably detecting underground nuclear detonations of one kiloton and over carried out without the use of any concealment technology. The auxiliary seismic stations are intended to clarify the data received at the primary stations with respect to the location and nature of recorded seismic events.** Data from the auxiliary stations are provided to the IDC only at its request, although the stations themselves are to operate continuously. Because of this role and with a mind to minimizing the costs of creating the IMS, the sites selected **during the negotiations** to be auxiliary stations were among a group of existing facilities that would require either no or minimal modernization, while over half of the sites for the primary seismic network either had not been in existence at the time the Preparatory Commission of the CTBTO was created or required substantial modernization.

The IMS radionuclide network consists of 80 stations equipped with atmospheric sampling and sample analysis equipment capable of detecting radioactive products in aerosol form produced as a result of a nuclear explosion and reaching the station through the movement of air masses. Such products appear in the atmosphere from atmospheric nuclear detonations and can be relatively easily detected. Underwater nuclear detonations can also be detected easily through radionuclide monitoring. With underground nuclear detonations, there is also a significant probability that the resultant radioactive products would rise to the surface and thus be detectable. Most likely to enter the atmosphere and be detected are the gaseous radionuclides, particularly the isotopes of xenon. For this reason, half of the radionuclide stations are to be equipped to detect radioactive noble gases. Sampling is to be **performed once a day, with the samples analyzed at the radionuclide stations themselves and the results reported to the IDC on a daily basis.** The analytical capabilities of the stations are supplemented by 16 certified laboratories that, when necessary (for example, if a sample has been found to contain the radionuclides that are indicative of a nuclear explosion), **can fur-**

then analyze the samples collected at the stations. The task of the radionuclide network is primarily to identify the nature of an event (whether or not it was a nuclear explosion) detected jointly with other monitoring technologies. At the same time, the radionuclide network has the independent capability of detecting atmospheric nuclear explosions of yields substantially less than one kiloton, and to a certain extent determining its location, if the movements of air masses following the event can be modeled. Although radionuclide monitoring stations already exist in many countries, the IMS radionuclide network sites will need to be created essentially from the ground up, due to the particulars of the task of monitoring nuclear tests.

The infrasound component of the IMS consists of 60 infrasonic monitoring stations capable of detecting low-frequency atmospheric vibrations anywhere in the world. At the time the CTBT was signed, infrasonic monitoring had been the least well-developed of all of the IMS technologies the Treaty stipulated. Only the nuclear powers had limited prior experience in its use, most of which had been in the 1950s and 1960s, when atmospheric testing was common. The infrasound network described in the Treaty has the capability of detecting nuclear detonations of a yield of one kiloton or more and determining their location with an acceptable degree of accuracy, provided that atmospheric conditions have been taken into consideration (in particular, wind speed and direction).

In order to detect underwater nuclear detonations and low-altitude detonations over water, the IMS includes 11 hydroacoustic monitoring stations. Six of these are situated in the Southern Hemisphere and consist of a series of hydrophones installed below the sea surface that are linked by cable to recording equipment on land (primarily on islands). There are also another five so-called T-phase stations situated along coastal shores in the Northern Hemisphere to detect seismic waves produced when hydroacoustic waves strike the sea bottom. The hydroacoustic network can detect underwater detonations of far less than one kiloton in nearly any marine location on Earth and determine their coordinates with sufficient accuracy.

All of the information received from the IMS sites is forwarded to the IDC for **integration, processing automatically by special programs**, and further expert analysis. The purpose of such information processing is to identify the phenomena and events within the vast volume of monitoring data that have parameters similar to those of a

nuclear explosion. The results of this work appear in various bulletins that the IDC releases. All member nations share equal access rights to both the raw IMS data (within the limits of an agreed-upon amount) and the standard set of IDC products at no cost. Moreover, if so requested by a member nation, the IDC can also specially process the data for particular inquiry parameters, for an additional fee. As per the meaning of the Treaty, the Provisional Technical Secretariat and the IDC are responsible for ensuring the continuous and reliable flow of technical information on all events detected by the verification mechanism that might appear to be nuclear detonations. However, the final judgment on whether one event or another actually has been a nuclear explosion is left for the member states to make.

Aside from the IMS stations, the Treaty also stipulates that data are to be sent to the IDC from the so-called cooperating national facilities, which could actually be one of the very stations that use any of the four CTBT monitoring technologies but were not selected for the IMS. These facilities, which would be made available by the member nations on a voluntary basis, are built and operated at the expense of each individual nation, while being required to meet all of the requirements for the IMS. Data from the cooperating national facilities would substantially supplement the information received through the IMS.

The most effective (and at the same time intrusive) element of the verification mechanism is the ability to conduct on-site inspections at the location of an anomalous event that might be reasonably suspected to have been a nuclear explosion. On-site inspections would be carried out for the sole purpose of confirming whether a test detonation of a nuclear weapon or any other kind of nuclear explosion had **indeed taken place in violation of the fundamental CTBT requirements**, and, to the extent possible, to gather any facts that might assist in identifying any possible violator. A request for an on-site inspection might be based not only on data collected by the IMS, but also on any other relevant technical information obtained through national technical verification means. Following consideration by the Executive Council of the CTBTO, a decision to initiate an inspection would pass if a minimum of 31 of the 51 members have voted in favor. Once an inspection has been approved, the nation under inspection would not be able to refuse to allow it. The area to be inspected would be decided by mandate and may not exceed 1,000 square kilometers. There would be a total of no more

than 40 persons in an inspection team, the members of which would be selected by the director general of the Technical Secretariat from among the individuals listed as inspectors in a list to be compiled following entry of the Treaty into force, based upon candidates proposed by the participating nations and the Secretariat staff and nominated by the director general. The inspection procedure would be structured in several periods (for a total duration of up to 130 days), each of which would include a number of inspection activities and techniques, such as overflights of the inspection areas, visual observation, gamma radiation monitoring, environmental sampling and analysis, passive seismic monitoring, mapping of magnetic and gravitational fields, etc. The Executive Council might also decide separately to conduct drilling in the area of a suspected nuclear explosion in order to obtain and analyze samples that could confirm that a nuclear explosion has indeed taken place. The fairly complicated process of initiating inspections would mean in practice that on-site inspections (OSI) would be used only in rare, exceptional circumstances. In order to prevent abuse of the right to make OSI requests, the Treaty stipulates that if the Executive Council has found a particular OSI request to be fabricated or deceptive, the state that made the request will be required to pay the cost of any preparations for the OSI. In addition, other measures may also be brought to bear against it, including suspension of its right to submit OSI requests for a certain amount of time.

A separate element of the NPT verification regime intended to serve as an additional factor to reduce the number of groundless inspection requests is the consultation and clarification process. Member nations are encouraged to conduct mutual consultations directly or through the Technical Secretariat or the Executive Council of the CTBTO prior to submitting any request for inspection, in order to clarify suspicions of possible Treaty violations. Should the appropriate request be filed, they would be required to submit all of the necessary clarifications within the timeframe specified by the Treaty. The director general of the Technical Secretariat will also be required to release all of the information at his disposal to clarify the CTBT violation issue.

The CTBT verification procedure does include one element that, although optional, is nonetheless important: confidence-building measures relating to large-scale conventional detonations. The problem is that there are many nations in the world today that conduct large-

scale chemical detonations for various purposes, principally for mining. The seismic characteristics of such explosions are often difficult to distinguish from those of nuclear tests. To avoid uncertainty and potentially unjustified inspection requests, member states are encouraged to voluntarily provide information in advance (explosive yield, location, and purpose) on any large-scale chemical detonations equivalent to 300 tons of TNT or greater. Representatives of the Technical Secretariat may also be invited to visit the sites of such detonations.

In summary, these are the elements of the verification mechanism that the Preparatory Commission of the CTBTO had begun creating in 1997. Obviously, this is a very multifaceted and weighty task, one which will require the investment of considerable financial and material resources by many countries. In 1997, the Commission member states had nothing to work with other than the text of the CTBT and some scattered national technical elements that were not universally applied and were not always used for nuclear test monitoring.

With each passing year, the lingering uncertainty over the CTBT's chances for entering into force makes it increasingly more necessary to define the status of the verification mechanism, its functions, and, accordingly, acceptable levels of funding for all of the member states during the preparatory period before the Treaty enters into effect. Today, 15 years after the CTBT was opened for signature, it seems clear that this mechanism would very probably be ready by the time the Treaty enters into force. There is nothing on the subject in the text of the CTBT itself, while the document establishing the Preparatory Commission of the CTBTO only mentions that the Commission is to be charged with the temporary operation of the verification mechanism. This, of course, does not address the following questions: why even have a verification procedure before the CTBT enters into force, if during this period its direct functions cannot be applied; and can such a costly mechanism be maintained through testing in anticipation of the Treaty's entry into force?

Throughout these uncertainties, the Preparatory Commission and its Provisional Technical Secretariat have continued to work on the establishment of the required technical components (IDC, IMS, and OSI) for the international CTBT verification mechanism.

As mentioned above, the creation of an IMS represents the most voluminous (and technically and organizationally complex) task, and is planned for three stages. During stage one, the IMS station sites are to be inspected, in particular from the standpoint of any po-

tential impediments to their effective operation and access to the required infrastructure.⁶ The second stage (for newly built facilities)⁷ involves design and on-site construction work and the purchase and installation of equipment. Stage three includes testing and certification. According to the Treaty, all such work is to be funded from the budget of the Preparatory Commission of the CTBTO and carried out by the Technical Secretariat or its contractors. The only exception would be in cases when the states themselves either use their own funds to perform such work or are subsequently reimbursed for the costs through a decrease in the size of their contributions to the Commission's budget.

Operation of the IMS stations (aside from auxiliary seismic stations) is also to be funded by the CTBTO. At the same time, according to the CTBT, all IMS facilities must remain the property of the country in which they are situated (or, in certain cases, of the nation responsible for a particular station), which presumes certain obligations on their part to ensure unimpeded construction and operation of such facilities. As early as May 1997, the Preparatory Commission approved a draft template for bilateral agreements between the Commission and the member states regarding the construction, modernization, and operation of IMS facilities prior to the Treaty's entry into force. The Technical Secretariat has concluded such agreements with only a few countries. The main problem is that until the Treaty enters into force, under the laws of many of the countries, the Preparatory Commission of the CTBTO cannot be recognized as an authorized international organization, and this creates problems in releasing the Commission and the Technical Secretariat from the need to pay taxes or other fees on imported equipment and services rendered, as well as in extending privileges or immunity to Secretariat personnel. This being the case, a pragmatic solution for this problem has been found: the necessary work can be initiated based upon exchanges of letters among the member states of the Commission wherein they stipulate fewer obligations on the parties compared to a standard format agreement, while **simultaneously allowing all of the work necessary** to build the IMS stations to proceed.

Work on establishing the IDC has been somewhat simpler from the very beginning, since even before the negotiations on the CTBT had ended, a prototype IDC had been established under the Third International Experiment, which had been used to work out to a significant degree the design approaches that were subsequently ap-

plied. Thus, in rather short order it was provided with all of the computer equipment and software necessary to automatically process and integrate data from all four of the monitoring techniques. Beginning in 2000, the IDC began releasing its products (bulletins), which are provided to the member states together with the raw data. Development continues to this very day in order to improve the **ability of the IDC to process IMS station data on an expedited basis** and provide the processed information to Commission members.

Almost immediately after work began on the IMS and the IDC, the need to address the communications system as a separate task became evident. Considering the fact that the IMS is global in nature, there was a requirement for a reliable Global Communications System (GCS) to ensure the expeditious transfer of data from each of the IMS sites to the IDC, as well as feed-back between the IDC and the stations to monitor their functionality and to transfer the IDC products and data to the national data centers. The first version of this system was established and operated between 1998 and 2007. Currently in place is a new upgraded version which utilizes the latest technological advances and possesses enhanced capabilities.

The goals that stood before the Preparatory Commission of the CTBT Organization in the area of OSI during the period until the Treaty's entry into force were initially formulated in the following way:

- develop an OSI Operations Manual and other documentation encompassing all of the legal, technical, and administrative procedures for preparing and conducting inspections;
- develop a list of the required inspection equipment, coordinate its specifications, and obtain and test the equipment;
- develop a training program for inspectors.

However, it became obvious at the very beginning of its work that the Preparatory Commission needed to address a much broader set of goals in addition to the methodology development listed above, and OSI technologies (of which there were over a dozen), their practical refinement in various training sessions and experiments, training of personnel participating in this work from the ranks of national experts nominated by the member states, creating the inspection infrastructure (including facilities for storage and maintenance of inspection equipment), and an operational support center designed to move into action upon receipt of an inspection request, fulfilling all

of the preparatory work and providing support for the teams during their inspections.

The OSI Operations Manual can probably be considered one of the most important documents that still need to be prepared before the Treaty enters into force, since on-site inspections are the most difficult and intrusive of all of the CTBT verification procedures. The great significance that member states attach to this document can be illustrated by the fact that Israel, for example, made its ratification of the CTBT directly contingent on the successful development of an Operations Manual. During the first stage, a “transitional” draft of the Operations Manual was developed, based upon suggestions from various nations and ideas from the Provisional Technical Secretariat. This represented the result of a year and a half of work by an editing team of specialists from a number of countries (primarily from the nuclear powers). The next, “negotiating,” stage began in June 2001, when representatives of the member states used the draft text as a basis to develop the content of the Operations Manual in an official setting and in an official format. Once this work began, however, it became clear that this was going to be a difficult and prolonged process that might take more than a year to complete. Indeed, this work continues today, using “model texts” as a basis for negotiation that primarily contain the general provisions without describing procedures in detail. These texts (bearing the name “Standard Operating Procedures”) have been developed by the Technical Secretariat as separate documents for each of the various types of inspection activities.

Experiments in the field and simulation training carried out by the Technical Secretariat have greatly contributed to the understanding of the OSI concept and the development of specific procedures, which are reflected in the Operations Manual.

With respect to the equipment for the inspections, lists and specifications of the instrumentation for passive seismological monitoring, gamma radiation measurement, and visual observation have been agreed to on a preliminary basis. Samples of passive seismic monitoring equipment have been purchased for testing. The fundamental conceptual questions relating to the storage and maintenance infrastructure for the inspection equipment and its transport to the inspection site have essentially been coordinated.

The Technical Secretariat has been providing familiarization training courses to potential inspectors since 1998. A first version of a long-term training program has been developed and tested, which

includes not only introductory courses but also more in-depth training in the main types of inspection techniques, along with operational simulation, and field training. A somewhat abridged version of this program was used to train participants for the first large-scale integrated field exercises, held in 2008 on the grounds of the former Semipalatinsk Test Site. A list has been prepared and continues to be updated of the trained national specialists who could be considered potential inspectors.

Russia has been making a significant contribution to the creation of a CTBT verification mechanism, going well beyond just the annual payments to the Preparatory Commission of the CTBTO (which it is making on time and in full). The Russian segment of the IMS consists of 31 stations (six seismic stations in the main network, 13 seismic stations in the auxiliary network, and eight radionuclide and four infrasound monitoring stations), the Central Radiation Monitoring Laboratory under the Ministry of Defense, the National Data Center (NDC) in the city of Dubna, and the independent Russian subsystem of the Global Communication System (equipment and communication channels) responsible for linking all of the Russian IMS and NDC facilities, as well as sending their data to the IDC and receiving IDC data and products. Russia is also actively involved in work on creating an inspection component of the verification mechanism, including the development of equipment, participation in work on drafting the Operations Manual, and expert support.

The discussion among the CTBTO Preparatory Commission member states on the degree of urgency in creating the CTBT verification mechanism and its level of funding (which comprises the greater portion of the Preparatory Commission's annual budget) has been predetermined since the first days of operation by the lack of any clear date for the CTBT to enter into force and consequently of a date by which a verification mechanism would need to be ready.

Western states, in particular members of the European Union, have insisted from the very beginning on accelerating the development of a verification mechanism, and have expressed a willingness to support significant increases in the annual budget for such purposes. Adhering to the principle that "the program should set the budget," they have suggested that a verification procedure functioning *de facto* would be a weighty argument in favor of CTBT implementation and would demonstrate the effectiveness of such a verification regime (naturally, without invoking OSI), and thus provides an additional incentive for

the countries that have thus far refrained from signing or ratifying the Treaty.

A different opinion, however, has been expressed by a majority of the developing nations, which have advocated a more balanced and pragmatic approach based upon the realistic prospects of the Treaty entering into force and their own financial problems. On these grounds, they have argued for minimizing the rate at which the budget would be allowed to increase, and at a certain point began demanding that it be frozen (eventually achieving this goal).

The “zero growth” budget today remains the main factor defining further progress in creating the verification mechanism. Only progress in the ratification of the CTBT by the United States and the other nations on the list of 44 will cause this approach to be reconsidered. As far as having a functioning verification mechanism in place before the Treaty enters into force, the agreed position is that it **should operate in test mode, without performing any verification functions.**

Despite these difficulties, there has been a considerable degree of readiness of the International Monitoring System already achieved, including the IDC and the Global Communications System that links it with the monitoring stations and the National Data Centers. Regarding the functioning IMS stations, Table 3 below presents generalized data for all four IMS components (seismic, infrasonic, hydroacoustic, and radionuclide) as of September 2009.

As may be seen from these data, the readiness level for the various sub-systems varies from 70 percent (the infrasonic network) to 91 percent (the hydroacoustic network). The readiness of the seismic monitoring subsystem is above 80 percent for the main network and no less than 75 percent for the auxiliary network. The deployment of capabilities for monitoring radioactive noble gases (isotopes of xenon) within the radionuclide monitoring subsystem should be viewed separately. For the time being, this is being carried out experimentally, with the number of stations to be gradually increased to the 40 called for in the Treaty. The results of this experiment have shown that equipping the remaining 17 stations to monitor radioactive noble gases and certifying them would be an entirely realistic goal. From a technical point of view, it would also be possible to launch almost all of the remaining stations within the same timeframe.⁸ This would seem quite favorable from the standpoint of the time constraints for creating the conditions for the CTBT to enter into force.

Table 3
Commissioned International Monitoring System Stations

IMS Stations	Total Number Under the Treaty	Launched	Undergoing Testing	Work Underway	Work Planned
Primary seismic network	50	40	4	3	3
Auxiliary seismic network	120	90	16	8	6
Infrasonic network	60	42	0	7	11
Hydroacoustic network	11	10	0	1	0
Radionuclide network (total)	80	57	6	10	7
Of which the following numbers of radionuclide stations monitor for radioactive noble gases	40	23 (experimental)			17

Concerning operational functionality, the degree to which the system's operability (as yet incomplete) meets agreed-upon criteria is also to be regularly checked, both in the course of routine operation and through partial and comprehensive testing. Although the reviews of the system have been generally positive, problems have arisen in providing proper access to the data from the monitoring stations. For example, between May and July 2009 there was no access to the data from 14 monitoring stations, and for at least two of those three months the access to the data from 30 other stations was less than 90 percent. There were various reasons for this, and they must be addressed.

With respect to the actual capabilities of the IMS to detect nuclear detonations, they have already been clearly demonstrated on at least two occasions. The first time was in 2006, when the North Korean nuclear test of a sub-kiloton yield (magnitude $M_b \sim 4$) on October 9, 2006, was picked up by 22 stations of the IMS seismic subsystem (including 13 primary stations). Although it was less well equipped at the time than it is now, the IDC nevertheless sent the first au-

tomatic data analysis results to the member states (including time, magnitude, and coordinates) within two hours of the event. Then, two weeks after the test, IMS radionuclide stations in Canada recorded elevated concentrations of xenon-133 in the atmosphere that corresponded to wind modeling data for a hypothetical release of this isotope from the test in question.

The second demonstration of the system's capabilities also involved a North Korean test, conducted on May 25, 2009. This detonation of slightly greater seismic magnitude ($M_b \sim 4.5$) was picked up by 61 seismic stations (including 31 primary network stations). The initial automatic processing data were released within an hour after the event, but the IMS radionuclide stations failed to detect the xenon isotopes and other fissile products from the explosion, which could be explained by their nearly complete containment, with only a tiny portion⁹ released into the atmosphere. Based on this, it would be logical to ask whether the capabilities of the radionuclide component of the monitoring system could be improved, remembering that the CTBT provides for further improvement to the monitoring system once it has entered into force. For the radionuclide subsystem, this might mean looking at supplementing its stationary network in the future with airborne radionuclide monitoring devices. Such a solution had first been proposed by the Russian Federation at the CTBT negotiations during the 1994-1996 Geneva Conference on Disarmament. On the other hand, the failure to detect radionuclide products from the second North Korean test emphasizes the importance of an inspection component to the CTBT verification regime. After all, in such cases only OSI can be relied upon to provide a more reliable indication as to whether an event is of a nuclear explosive nature.

At the present time, the work of the CTBTO Preparatory Commission on creating an effective inspection component for the verification system is less close to completion. This task is much more complex, for several reasons. Above all, an on-site inspection regime of such great scientific and technical intensity and complexity (having over a dozen technologies of various kinds dedicated to narrowing the search focus, identifying the locations of suspicious events with the greatest possible accuracy, and determining the true nature of such events) has neither the analogous verification systems established for other treaties nor the practical experience in detecting detonations that the IMS technologies will gain

over many years, especially seismic monitoring. This is the reason that OSI has lagged behind the IMS from the very beginning, since the start of the Preparatory Commission. There has also been another even more fundamental distinction that makes the OSI task all the more complex. For the IMS, there is a great deal of similarity in signals from nuclear detonations. The seismic signals from underground nuclear detonations, for example, possess a number of typical characteristics that are essentially independent of test location or other parameters of the explosion. This substantially simplifies the task of differentiating them from sources of a non-explosive nature. Meanwhile, the OSI would face an endless variety of potential scenarios that depend on such factors as topography, climate, local geology, and other characteristics of the particular inspection area, environment, or particulars of the suspicious event, the nature of which must be clarified, as well as on interactions with the country being inspected, which can give the inspection a game-like character. Therefore, OSI readiness criteria have not yet been defined that would not already apply to the IMS. For now, it seems likely that the focus will remain on operational readiness (in the sense of the capability of performing any of the operations), beginning with the arrival of the inspection team and its equipment at the point of entry into the country being inspected and ending with the completion of post-inspection work, in strict compliance with the time constraints imposed by the Treaty.

Nevertheless, some progress has been achieved in developing the inspection component, as well. This was particularly evident during the first large-scale integrated OSI training exercises held in September 2008. The experience gained from them led to the development of an "Action Plan," which included continued improvement of inspection technology in those areas where significant experience in applying them to OSI was lacking;¹⁰ acquisition and testing of needed equipment; continued development of infrastructure; progress in developing a draft OSI Operations Manual and other documents; and completion of another training cycle for potential inspectors. The progress that has been made toward establishing the OSI regime will be demonstrated by another round of large-scale integrated training exercises planned for around 2013. It is anticipated that the implementation of this plan will establish the minimum level of operational readiness required to undertake OSI missions. Naturally, the development of OSI capabilities

should not be frozen there, but should continue so as to improve them to the point that there will be a high probability that the OSI goals will be achieved under any operational scenario or conditions. This, however, should be pursued both prior to and following entry of the CTBT into force.

As for the rest of the elements of the verification mechanism (consultation, clarification, and confidence-building measures), there remain very limited tasks for the CTBTO Preparatory Commission to complete. The provisions of the Treaty already describe the application of these elements in some detail, and, therefore, they require essentially no additional documentation to be developed. Regarding confidence-building measures, the Commission has prepared a standard formulary for voluntary notification when conducting large-scale chemical detonations. Work on coordinating standardized forms, inquiries, and responses for consultation and clarification has been completed.

Thus, it can be anticipated that with respect to the readiness of the verification system, its minimum required level could be achieved within a couple of years, thereby satisfying the respective requirements of the CTBT.

NOTES

- 1 At the start of the Conference on Disarmament, there were 37 nations listed as members. By the time it ended, the membership had grown to 60 nations.
- 2 This was done in order to ensure enough time to bring the verification mechanisms up to the requisite level of readiness (to deploy stations, etc.). In reality, this precautionary measure proved superfluous.
- 3 This list appears in Annex 2 to the Treaty. The criterion for inclusion in the list was membership in the Conference on Disarmament as of June 18, 1996, formal participation in the CTBT negotiations, **and the simultaneous** presence of nuclear power or research reactors, confirmed by the respective IAEA certificate. The list consists of Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chili, China, Colombia, Egypt, Finland, France, Germany, Great Britain, Hungary, India, Indonesia, Iran, Israel, Italy, Japan, Mexico, the Netherlands, North Korea, Norway, Pakistan, Peru, Poland, Romania, the Russian Federation, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, the United States, Vietnam, and Zaire.
- 4 India's stance is described in further detail in Section 7. Pakistan justified its decision by citing India's refusal to back the Treaty.

- 5 It is possible that India and perhaps even Pakistan conducted their tests intending to then join the Treaty quickly with minimal damage done to its spirit and letter. After all, these tests were conducted before the end of the two-year period during which under Article XIV the CTBT could not enter into force in any case. Thus, at the time, none of the nations could be formally bound to Treaty obligations. In a certain sense, this is reminiscent of the situation with France, which conducted its last tests after the negotiations on the CTBT had already started at the Conference on Disarmament, but before they ended.
- 6 The results of such inspections (along with other reasons) have already made it necessary to change the location of a considerable number of the stations listed in Annex 1 to the Protocol. Formally, this Annex may be amended only after the CTBT has entered into force, in accordance with the procedure established in its respective provisions. However, the Preparatory Commission of the CTBTO allows the member states to alter their stations' coordinates for valid reasons, moving them to new locations selected upon the recommendation of the PTS. Of course, this move must be formally registered once the Treaty enters into force by duly making the required corrections to the Annex.
- 7 The stations that are already in existence, as a rule, require a certain amount of modernization and the addition of equipment for communicating with the IDC and thus will also need a second phase.
- 8 Exceptions are the several stations that are to be deployed in India (one primary and one auxiliary seismic station, one radionuclide and one infrasonic station) and in Pakistan (one primary seismic station and one infrasonic station). Work on these will begin only after the two countries have signed the CTBT.
- 9 According to the Technical Secretariat of the CTBTO Preparatory Commission, the inability of the IMS to detect xenon-133 following the second North Korean test meant that the amount that had been released into the atmosphere comprised less than 0.1 percent of the total amount produced during the detonation.
- 10 These include active seismic surveys and resonance seismometry, multi-spectral imaging (including the infrared portion of the spectrum), and targeted drilling in the presumed epicentral zone.

CHAPTER 21

FISSILE MATERIAL PRODUCTION

Roland Timerbaev

Recently rekindled active interest in nuclear disarmament has made the renewed search for a solution to the problem of weapons-grade fissile materials particularly relevant. In their joint statement on the results of the summit on April 1, 2009, Russian President Dmitry Medvedev and U.S. President Barack Obama expressed support for international negotiations for a verifiable treaty to end the production of fissile materials for nuclear weapons.

The issue of prohibiting the production of fissile materials for military purposes first became a topic of international discussion back in 1957, when the United States – with participation of other Western powers (Canada, France, and Great Britain) – submitted a working document on partial disarmament measures to the London Subcommittee of the UN Disarmament Commission, which stipulated a commitment by the Convention members to put all future production of fissile materials on their own territories or abroad under international controls and not use these materials for weapons purposes, including stockpiling.¹

For completely understandable reasons at the time, the Soviet Union approached the U.S. proposal to prohibit the fissile material production as a standalone arms limitation measure less than enthusiastically. In a statement released to the London Subcommittee (which the author of this chapter helped to draft), the government of the Soviet Union declared that a prohibition of military-purpose fissile material production would become a real step toward eliminating the threat of nuclear war only if it is irrevocably linked with the prohibition of nuclear weapons, putting them out of service and destroying nuclear weapons stockpiles.² It must be noted that the British, while officially supportive of their transatlantic ally, in fact were disposed unfavorably toward the U.S. proposal.³

Still, the United States insisted in late 1957 that the General Assembly of the United Nations adopt a resolution proposing that

priority in future disarmament negotiations be assigned to “the cessation of the production of fissile materials for weapons purposes and the complete devotion of future production of fissile materials to non-weapons purposes under effective international control.”⁴ The Soviet delegation voted against the resolution.

Thus, the issue of tying the halt in production of fissile materials to the problem of their accumulated stockpiles (which has become one of the greatest stumbling blocks to solving the problem of weapons-grade nuclear materials) arose during the earliest stages of the fissile material cut-off debate.

First Steps

Nevertheless, the United States and the Soviet Union had agreed by the mid-1960s to some modest but meaningful steps toward reducing somewhat the rates of production of such weapons-grade nuclear materials as plutonium and uranium-235.

On April 20, 1964, U.S. President Lyndon Johnson announced that the United States would reduce its production of plutonium by 20 percent and of enriched uranium by 40 percent.⁵ The following day, Nikita Khrushchev announced that the Soviet government had decided to halt the construction of two new large plutonium production reactors and would also substantially cut its production of uranium-235 for weapons purposes and use more of its fissile materials instead for peaceful purposes.⁶

As the Cold War drew to a close in the late 1980s and early 1990s, the majority of the nations possessing nuclear weapons had begun the process of halting the production of nuclear materials for weapons. According to some official data and estimates by the international expert community, production of plutonium was halted in the United States in 1988, Great Britain in 1989, China in 1991, France in 1994, and Russia in 1997. India and Pakistan, however, have continued to produce plutonium, and Israel may still be producing weapons-grade material, as well. As far as highly-enriched uranium (HEU) is concerned, production was ended by Great Britain in 1963, Russia in 1987-88, China in 1987-89, the United States in 1992, and **France in 1996. India and Pakistan are continuing HEU production; however, there are no data available for Israel or North Korea.**⁷

Under conditions such as these, it became possible to create a new incentive for concluding an international agreement (in the form of either a treaty or a convention) to prohibit the production of fissile materials for nuclear weapons (the Fissile Material Cut-off Treaty, FMCT). In 1993, the General Assembly of the United Nation unanimously adopted a resolution recommending the negotiation of “a non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices,” and simultaneously requested assistance from the IAEA in finding appropriate verification measures for the treaty.⁸

From that time to the present day the fissile material cut-off issue has remained within the authority of the Geneva Conference on Disarmament.

FMCT Discussions at the Conference on Disarmament

In March 1995, the Conference on Disarmament succeeded in approving the so-called Shannon report (named after the Canadian representative appointed as coordinator of the FISSBAN talks) on the establishment of a special negotiating committee. Although the report defined the mandate of the Committee based on the UN General Assembly resolution formula (and thus provided for the adoption of a treaty to prohibit fissile materials production), it nevertheless stipulated (at the insistence of such nations as Algeria, Egypt, Iran, and Pakistan) that it “does not preclude any delegation in the Ad Hoc committee from raising for consideration... any of the above noted issues,” including that of existing fissile material stockpiles.⁹ Thus, **the approach to the mandate for negotiations represented a compromise** that also considered the positions of those countries that were pressing for a solution to the issue of stockpiles.

The Conference on Disarmament established an *ad hoc* FMCT committee in August of 1998, which as of the present day has yet to begin work. Although under the rules of the Conference a new action plan and mandates for each of the respective *ad hoc* committees are required to be adopted at the beginning of each year, it has not yet been able to agree on either of these. While France, Great Britain, Russia, the United States, and some other coun-

tries have urgently appealed to the Conference to begin negotiations on the FMCT, other nations have favored giving priority to and conducting negotiations on other disarmament issues such as the prevention of the weaponization of space, nuclear disarmament, and security guarantees for non-nuclear nations.

In 2004, the U.S. administration radically altered its position on the FMCT, abandoning its previous commitment to verification measures for the respective treaty, and in 2006, the U.S. delegation submitted its own FMCT draft based upon this negative attitude toward verification. The working paper for the draft document indicated that “The U.S. draft treaty omits verification provisions, consistent with the U.S. position that the so-called ‘effective verification’ of an FMCT cannot be achieved. The ability to determine compliance with a high level of confidence is a requirement for effective verification. The United States has concluded that, even with extensive verification mechanisms and provisions (so extensive that they could compromise the core national security interests of key signatories, and so costly that many countries would be hesitant to implement them), we still would not have high confidence in our ability to monitor compliance with an FMCT.”¹⁰

As for the draft itself,¹¹ it proposed that no “party ...produce fissile material for use in nuclear weapons or other nuclear explosive devices, or use any fissile material produced thereafter in nuclear weapons or other nuclear explosive devices.” The United States suggested that fissile material be defined as weapons-grade plutonium¹² or uranium of 20 percent or greater enrichment in the isotopes uranium-233 or uranium-235.

The U.S. draft thus avoided any mention of existing fissile material stockpiles. As for the verification itself, the draft only mentioned using “national means and methods.” The resistance among U.S. government agencies to a verifiable ban is thought to have arisen for two reasons: due to the difficulty of detecting clandestine enrichment and processing activities (with more intrusive verification methods being unacceptable to the United States), and to the unwillingness on the part of the United States to place HEU intended for marine nuclear reactors under verification. One motive for resisting the verification was to simplify the implementation of the notorious U.S.-India nuclear deal concluded in 2005.¹³

The U.S. draft met with a lukewarm reception at the Conference on Disarmament due to its lack of any provisions to deal either with

existing fissile material stockpiles or with compliance verification.¹⁴ Even the closest U.S. allies voiced objection.¹⁵ This appears to be the reason why Barack Obama announced in Prague on April 5, 2009, that the United States desired a “verifiable” FMCT. This was a positive move by the new U.S. administration, and it is important now to see exactly how it will unfold.

In 2009, a strong push was made at the Conference on Disarmament for resuming the FMCT negotiations, and in May of that year an agenda was finally agreed upon under which negotiations on the matter were to begin.¹⁶ Soon thereafter, however, this deal unfortunately broke down due to the negative attitude of Pakistan, supported by China. In 2010, new additional efforts were unsuccessful in eliciting positive results. In March, the Conference chairman (the representative from Belarus) once again made an attempt to draft an agenda aimed at opening FMCT negotiations¹⁷ with the support of a considerable number of nations (including Russia and the United States), but Pakistan once again blocked its adoption.¹⁸

Steps Toward Reducing Stockpiles of Fissile Materials

Despite the lack of any multilateral agreements on a fissile material cut-off, Russia and the United States have made substantial efforts over the past 10 to 15 years to reduce their fissile material stockpiles. Aside from a halt to the production of these materials by them and a number of other nuclear nations, as mentioned above, the two powers also undertook such measures as signing the 1993 HEU-LEU agreement for 20 years, under which 500 tons of highly-enriched uranium removed from dismantled Russian nuclear warheads was to be blended down by Russia and sent over for use as fuel in U.S. civil nuclear power plants;¹⁹ signing an agreement in 2000 on the recycling of plutonium, under which each party was required to convert its weapons-grade plutonium into forms unusable for nuclear weapons, either by burning it as reactor fuel or converting it into immobilized forms that are only suited for geological entombment (although, it is true, this recycling agreement covering 34 tons of plutonium for each country, is still not being implemented); the Nunn-Lugar program ensuring the security of fissile materials and reduction in their production; the trilateral initiative on verifi-

cation of excess nuclear materials developed by Russia, the United States, and the IAEA in 1996-2002;²⁰ and the joint GTRI program to convert research reactors from HEU to LEU.

Nevertheless, despite all of their significance, such bilateral measures cannot compare to a full-fledged fissile material cut-off agreement that would strengthen the nonproliferation regime and make progress toward a world free of nuclear weapons.

The data given in the following tables²¹ on the presence of fissile materials in various states were compiled on the basis of official statements and independent expert assessments and speak for themselves.

The International Panel on Fissile Materials (IPFM) estimates that by mid-2008 the total world supply had reached 1,670 tons (with a margin of error of 300 tons) of highly-enriched uranium and 500 tons of plutonium. **Half of this amount is for civil use, which continues to grow.**²²

These data testify to the enormity of the amounts of weapons-grade nuclear materials, and lead to the obvious conclusion that radical steps will be required in order to reduce, and eventually fully eliminate, the threat to the world posed by the stockpiling of fissile materials that could be used for nuclear weapons.

International Expert Proposals For the FMCT

There have been numerous suggestions by government and non-government experts on possible approaches to the resolution of the FMCT problem.

In 2001, Annette Schaper of the Peace Research Institute in Frankfurt (Germany) proposed an FMCT verification system that was based on IAEA safeguards. This proposal comprised the comprehensive safeguards systems outlined in INFCIRC/153 and the Additional Protocol provided by INFCIRC/540, a managed access for nuclear states with consideration of their need for maintaining secrecy, reliance upon national technical means for verification, and other measures. It also suggested that the task of developing the necessary criteria for FMCT safeguards be delegated either to the Standing Advisory Group on Safeguards Implementation (SAGSI) or to another similar group of experts. In particular, it proposed defining the IAEA's nuclear fuel verification function for nuclear vessels in more detail than in the existing model safeguards agreement provided under

INFCIRC/153 (paragraph 14).²³ At the International Conference on Disarmament in Moscow on March 5-6, 2010, Schaper emphasized that the FMCT is important because it will enhance the irreversibility of nuclear disarmament and compliance with Article VI of the NPT, reduce the discriminatory nature of this Treaty, expand the nonproliferation regime to include nations that remain outside the NPT, and reduce the risk of nuclear terrorism.

Table 4
Highly-Enriched Uranium Stockpiles (metric tons)

Category	Country								
	Great Britain	Israel	India	China	Pakistan	R.F.	U.S.	France	Non-nuclear – weapon States
Eliminated	no data	no data	no data	no data	no data	337	96	no data	no data
Excess (primarily for blend-down)	no data	no data	no data	no data	no data	163	137	no data	no data
Civilian material	1.4	no data	no data	no data	no data	30	30	5.1	10
Irradiated (for marine reactors)	4.5	no data	no data	no data	no data	50	100	no data	no data
Fresh (for marine reactors)	no data	no data	no data	no data	no data	100	128	no data	no data
Stockpiles available for weapons purposes	16.4	0.1	0.6	20	2.1	590	250	30	no data
Total:	22.3	0.1	0.6	20	2.1	1270	741	35.1	10

Source: *Global Fissile Material Report 2009: A Path to Nuclear Disarmament* (Princeton: The International Panel on Fissile Materials, 2009), P. 13.

Note: The figures for Russia are approximated to within 300 metric tons.

Table 5
Plutonium Stockpiles (metric tons)

Category	Country											
	Belgium	Great Britain	Germany	Israel	India	China	N. Korea	Pakistan	R.F.	U.S.	France	Japan
Civilian stockpiles stored outside the country (Jan. 2008)	no data	0.9	12	no data	no data	no data	no data	no data	no data	no data	no data	38
Civilian stockpiles stored in the country (Jan. 2008)	0	76.8	1	no data	no data	no data	no data	no data	44.9	no data	54.9	8.7
Additional strategic stockpiles	no data	no data	no data	no data	6.8	no data	no data	no data	no data	no data	no data	no data
Excess material for weapons purposes	no data	4.4	no data	no data	no data	no data	no data	no data	34	53.9	no data	no data
Stockpiles available for weapons purposes	no data	3.5	no data	0.65	0.7	4	0.035	0.1	111	38	5	no data
Total:	0	85.6	13	0.65	7.5	4	0.035	0.1	189.9	91.9	59.9	46.7

Of interest was the proposal made by Australia in 2006. The Australian working document contained their ideas on how best to achieve progress in resolving the FMCT problem. Considering the complexity of developing verification methods and procedures, the Australians suggested that an “alternative approach – which was demonstrated very successfully by the NPT – is to have the basic political commitments in a principal treaty, and to set out the verification system in a secondary agreement (or series of agreements...)”²⁴

In this regard it is worth recalling that Article III of the NPT (which opened for signature on July 1, 1968, and entered into force on March 5, 1970) requires each non-nuclear Treaty member to conclude an IAEA safeguards agreement covering all of its nuclear activities. Such safeguards agreements must enter into force no later than 180 days after the country joins the Treaty. However, the IAEA was then not in any position to sign such agreements, since the safeguards systems that existed before the Treaty had been intended only for verifying individual nuclear facilities, while the NPT required a comprehensive system.

Once the Treaty entered into force, a special IAEA Board of Governors committee was established, which took until 1972 to finish drafting a model comprehensive safeguards agreement (subsequently approved by the Board of Governors as INFCIRC/153). Only then did the non-nuclear parties to the Treaty and the Agency begin negotiations, which in some cases continued for years. For example, the safeguards agreements between Euratom (the European Atomic Energy Community) and the IAEA did not enter into force until February 1977, while some essential annexes and attachments to the agreements, without which verification would simply be unachievable in practice (particularly the so-called “facility attachments”), were adopted even later than that, entering into force in March 1979.²⁵ In fact, quite a few countries have not yet signed a safeguards agreement.²⁶

The international IPFM group, comprised of experts from a number of both nuclear and non-nuclear countries and co-chaired by Frank von Hippel (the United States) and Ramah Rajaraman (India), released its own draft FMCT in February 2009.²⁷ This document proposed prohibiting the production of weapons-grade plutonium and uranium enriched to 20 percent or greater in the isotopes uranium-233 or uranium-235. The IAEA would verify compliance with the Treaty and be granted certain additional functions. All future production of fissile materials for civil purposes would be placed under an IAEA safeguards system in order to prevent their conversion to weapons use.

The draft Treaty not only prohibited future fissile material production, but also provided certain measures for dealing with existing stockpiles. It was proposed that the countries from the very beginning identify which of their already accumulated stockpiles they wished to reserve for weapons, and how much they would submit to international safeguards. Thus, the draft would require that fis-

sile materials intended for military use be separated from materials for civil purposes before the Treaty entered into force. According to the draft Treaty, the nations would be required to declare all fissile materials excess to military use (as well as materials that will become excess as a result of unilateral, bilateral, or multilateral disarmament measures), and submit them to IAEA safeguard.

An appropriate IAEA safeguards system will need to be developed for fissile materials intended for use as fuel for marine nuclear propulsion or in other military reactors. According to the article by Arend Meerburg and Frank von Hippel in the March 2009 issue of *Arms Control Today*, work on developing appropriate Agency verification measures for HEU used in marine nuclear reactors without the disclosure of confidential data on such materials has already been underway at Princeton University and the Oak Ridge National Laboratory.

Another idea on how to deal with accumulated fissile materials has been suggested by Robert Einhorn and Matthew Bunn.²⁸ Calling their idea the Fissile Material Control Initiative (FMCI), the authors focus on the accumulated stocks of these materials, and suggest that their proposed initiative function in addition to the treaty prohibiting future fissile material production. These measures would complement one another and be implemented at the same time. Moreover, Einhorn and Bunn believe that if the FMCT negotiations were to appear to be approaching a deadlock, their initiative could proceed independently of the Treaty, and this, they suggest, could actually contribute to the process of concluding the FMCT, because the improved transparency regarding existing stockpiles of such materials would reduce concerns about the Treaty and its proposed verification procedures on the part of some states.

What would the proposed Initiative on fissile material verification mean? It is being envisioned as a multilateral agreement that would cover the world's fissile material stockpiles, both military and civil, possessed by any state, whether nuclear or non-nuclear, NPT member or not. Its main objective would be to reduce security risks through measures designed to improve accountability and the physical security of such materials and increase transparency; to gradually and irreversibly place all materials not intended for weapons use under international monitoring and safeguard; and to convert the stockpiles no longer needed for nuclear weapons into forms that would be unsuitable for nuclear weapons use.

It proposed that the countries participating in the Initiative join in a mutual declaration of guiding principles that might include the following:

Initiative participants would issue regular notifications about their existing fissile material stockpiles in as much detail as possible and ensure that the procedures used for accounting and the physical security of these stockpiles meet high standards of security. Those states that possess nuclear weapons would regularly report the amount of material that had previously been intended for their nuclear weapons program and had since become superfluous, and such states would place the excess material under IAEA monitoring or safeguard as soon as possible. Initiative participants would place all of their civil HEU and entire civil plutonium stockpile under Agency safeguards; place the HEU used for marine reactors and other non-explosive military purposes under a system of accounting designed specifically to prevent HEU from being shifted to nuclear weapons programs, while avoiding the disclosure of sensitive information; work to minimize and eventually exclude the use HEU for civil purposes and seek to reduce national civil stockpiles of plutonium; convert excess fissile material into forms not suitable for producing nuclear weapons; and, finally, provide annual progress reports on these guiding principles.

With respect to formalizing an agreement on the guiding principles, it was proposed that it should have been entered into on a voluntary, legally non-binding basis, and that it be developed not at the Conference on Disarmament, but by a small group of states that would enter into informal discussions with other countries for the purpose of involving key states (it would, of course, be very desirable and even imperative for all nuclear nations to participate, whether party to the NPT or not, as well as those nations that operate their own uranium enrichment and reprocessing facilities.) Simultaneously, it was proposed that some sort of small-scale information-sharing mechanism be established. The IAEA would play a significant role in the implementation of the initiative. As Robert Einhorn emphasized, this process should be gradual and “evolutionary.”²⁹

Such proposals by the experts are of interest and may also be useful in future efforts to resolve the FMCT impasse.

Consequent Measures

The more than 50-year history of international debate on the problem of FMC is convincing evidence that the solution of this important problem might have a real chance for success in the sense of its perception and support by the international community only in the event that along with prohibiting future production of fissile material for weapons purposes, a shift is made in the direction of regulating or at least increasing transparency over the existing stockpiles of such materials. Otherwise, all further FMCT discussions will be seen as simply an effort to maintain the existing inequalities between one group of states and other countries, and as yet another attempt at discrimination,³⁰ and the current impasse will continue.

All attempts to move forward with a resolution of the problem have been hampered not only by the issue of stockpiles, but also by the multiple difficulties that arise in developing appropriate measures of transparency and verification. **To attempt to obtain an unverifiable FMCT would be futile** (the U.S. administration has also acknowledged this.) Verification itself, however, has proven a very tough nut to crack.

Most experts believe that a verification system should be structured on the existing IAEA safeguards, and the original UN General Assembly resolution of 1993 in fact contained a request to the IAEA that it render assistance in resolving the FMCT verification problem. The Agency, however, while having the necessary authority by charter and a great deal of experience in providing verification that nuclear material is not being diverted from peaceful to military purposes, does not have sufficiently advanced methods and procedures in place to monitor weapons-grade fissile materials, HUE used in marine nuclear reactors, and the like.

Still, the IAEA does have certain experience. In the 1990s, through the use of safeguards, the Agency had been able to ascertain that the nuclear materials that had previously been in warheads in South Africa had been removed from the weapons program and were no longer **being used for military purposes. During the same time period**, by decision of the UN Security Council, the Agency oversaw the dismantling of the military nuclear program in Iraq.

The United States, Russia, and the IAEA had developed verification procedures for excess weapons-grade fissile material between

1996 and 2002 under the so-called Trilateral Initiative, proposing that the method of information barriers be used to prevent the disclosure of sensitive information. Measures to test the method in use were in principle agreed upon for the verification of the Mayak nuclear storage facility in Russia and the KAMS storage at the Savannah River facility in the United States;³¹ however, this work was never completed. Thus, although the IAEA has had some experience, this alone would not be enough for the task of verifying the FMCT. A system of safeguards and verification will need to be developed that focuses specifically on these objectives, but it can be assumed that this will not require any revision of the Agency's Charter. In this respect, the Charter already grants the Agency sufficiently broad authority: in Article II, for example, it specifically states that "the Agency shall ensure, so far as it is possible, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose," and Article III, Paragraph A, Subparagraph 5 provides the Agency with the right to "establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision and control are not used in a way as to further any military purpose; and to apply safeguards, at the request of the parties, or any bilateral or multilateral agreement, at the request of a state, to any of that state's activities in the field of atomic energy."

Undoubtedly, substantial effort will be required to develop a new FMCT verification system that incorporates not only the NPT safeguards and the Additional Protocol on Safeguards, but also (which is the most difficult) certain coordinated verification both of stockpiles and of the HEU used for marine nuclear reactors, and perhaps some other elements of verification. The infrastructure of the IAEA will need to be significantly reinforced, and it will have to be outfitted with new and continuously upgraded modern equipment provided with the capability of satellite monitoring, new personnel will need to be trained, the number of inspectors will need to be increased, and so on, and this will mean an unavoidable increase in the organization's budget.

This leads to the conclusion that the most pragmatic solution would be to sign an underlying internationally binding treaty establishing legal standards for the prohibition of the production of fissile materials for nuclear weapons and the gradual reduction of stock-

piles of such materials. The Treaty would also need to contain a fundamental provision on Agency verification of compliance with these obligations, with the proviso, of course, that such verification should in no way further the proliferation of technologies that could lead to the creation of nuclear weapons.³²

The most realistic procedure for implementing verification mechanisms would be a gradual, stage-by-stage approach that would begin with the existing IAEA safeguards system and Additional Protocol and would eventually extend to include the more complex and sensitive components of the nuclear fuel cycle.

Conclusion of the FMCT would only make sense if all of the nuclear nations (irrespective of their NPT status) participated in it, as well as other nations, in particular those having advanced nuclear technologies and industrial capacities (the so-called “threshold states”). Before being submitted for broader consideration, the initial draft of this Treaty would probably best be developed by a more or less limited group of key states rather than the larger and far more difficult to manage Conference on Disarmament. A leading role in this process could be assumed by the countries having the largest stockpiles of weapons-grade fissile material in the world, as well as some other countries.

NOTES

- 1 Document DC/SC.1/66/Rev.1 of August 29, 1957. *Main Disarmament Documents*, vol. II (1957-1958) (Moscow: The USSR Ministry of Foreign Affairs, 1961), PP. 171-179.
- 2 Document DC/SC.1/65/Rev.1 of August 27, 1957. *Main Disarmament Documents*, vol. II (1957-1958) (Moscow: The USSR Ministry of Foreign Affairs, 1961), PP. 171-179.
- 3 Astrid Forland, “Coercion or Persuasion? The Bumpy Road to Multilateralization of Nuclear Safeguards,” *The Nonproliferation Review* vol. 16, no. 1 (March 2009): P. 52.
- 4 General Assembly of the United Nations, *Resolution 1148(XII)* of November 14, 1957.
- 5 Eighteen Nation Committee on Disarmament document ENDC/132, *Pravda*, April 21, 1964.
- 6 Document ENDC/131, *Pravda*, April 21, 1964.
- 7 Table from M. Bunn, *Fissile Material Control Initiative*, 2009, which was kindly sent to the author of this chapter. The table was based on avail-

able official statements, expert assessments, and the following famous study: David Albright, Frans Berkhout, and William Walker, *Plutonium and Highly-enriched Uranium 1996: World Inventories, Capabilities and Policies* (SIPRI, Oxford University Press, 1997), PP. 38, 68, 76, 80. It is believed that the United States stopped producing highly-enriched uranium for weapons purposes in 1964, but that the country produced HEU for naval nuclear reactors until 1992. Although it had stopped using plutonium for weapons purposes in the late 1990s, Russia still continued to produce plutonium for the three dual-use industrial reactors (in Seversk and Zheleznogorsk), which both produced plutonium and supplied the region's fuel and electricity needs. The last of these reactors in Zheleznogorsk suspended the production of plutonium in 2009 (<http://www.newslab.ru/news/281547>). On September 14, 2009, Rosatom director Sergey Kiriyenko told an IAEA General Conference session that the reactor was to be fully stopped in 2010 (official Rosatom website).

- 8 A/RES/48/75L of Dec. 16, 1993.
- 9 Document CD/1299 of March 24, 1995.
- 10 Document CD/1782 of May 22, 2006.
- 11 Document CD/1777 of May 19, 2006.
- 12 According to the U.S. Department of Energy, however, an explosive nuclear device can be produced using essentially any combination of plutonium isotopes. See *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives*, U.S. Department of Energy, DOE/NN-0007 (Washington, D.C., January 1997), PP. 37-39, www.ipfmlibrary.org/doe97.pdf.
- 13 R.J. Einhorn, "Controlling Fissile Materials Worldwide. A Fissile Material Cut-off Treaty and Beyond," in *Reykjavik Revisited*, ed. G. Shultz, S. Andreasen, S. Drell, and J. Goodby (Stanford, CA: Hoover Institution Press, 2008), PP. 281-182.
- 14 For further details on the CD's response to the draft, see: Jenni Rissanen, "Time for a Fissban or Farewell?" *Disarmament Diplomacy*, no. 83 (Winter 2006).
- 15 Einhorn, "Controlling Fissile Materials."
- 16 Document CD/1864.
- 17 Document CD/WP.559.
- 18 The renowned Indian Prof. Rajaraman told the March 5-6, 2010, session of the Moscow International Conference on Nuclear Disarmament that Pakistan's refusal to join the FMCT talks may be explained by India's dominance in plutonium stockpiles (including stockpiles of plutonium used for energy purposes). Rajaraman suggested that Pakistan would stop

- producing weapons-grade material only once India does the same, but India will only do so “once it has established that its arsenal is strong enough to maintain a minimal level of deterrence” (in other words, in another decade or so).
- 19 To date over 380 tons of HEU have already been converted to LEU.
 - 20 Although the United States and Russia had been on the verge of agreeing to a standard verification agreement in November 2001, negotiations broke off after the Bush administration announced that it did not support the 13 practical steps on disarmament approved by the NPT Review Conference in 2000 (which included the Trilateral Initiative). Russia also did not express any willingness to continue the initiative. By 2002, however, the two sides officially announced that the initiative had been a success, and that it was now time to implement it through individual agreements. (Thomas E. Shea, “The Trilateral Initiative: a Model for the Future?” *Arms Control Today*, May 2008).
 - 21 Bunn, *Fissile Material Control Initiative*.
 - 22 *Global Fissile Material Report 2008*, <http://www.fissilematerials.org>.
 - 23 Annette Schaper, *Principles of the Verification for a Future Fissile Material Cut-off Treaty (FMCT)*, (Frankfurt: Peace Research Institute Frankfurt, January 2001), *PRIF Reports*, no. 58.
 - 24 Document CD/1775 of May 17, 2006.
 - 25 David Fischer, *History of the International Atomic Energy Agency. The First Forty Years* (Vienna: The Agency, 1997), PP. 254-258.
 - 26 IAEA Director General ElBaradei told the September 14, 2009, General Conference meeting that 25 states party to the NPT had not signed such agreements with the Agency (www.iaea.org).
 - 27 For a detailed analysis of the draft, see: Arend Meerburg and Frank N. von Hippel, “Complete Cut-off: Designing a Comprehensive Fissile Material Treaty,” *Arms Control Today*, March 2009.
 - 28 Einhorn, “Controlling Fissile Materials,” PP. 279-311; Bunn, *Fissile Material Control Initiative*. Einhorn was an independent expert at the time, although he later joined the Barack Obama administration.
 - 29 Einhorn, “Controlling Fissile Materials,” P. 309.
 - 30 It should be stressed that the UN General Assembly’s unanimously adopted resolution of 1993 envisioned a verifiable and *nondiscriminatory* FMCT.
 - 31 Shea, “The Trilateral Initiative.”
 - 32 The NPT, as has already been mentioned, is also an underlying treaty because it implements its verifications on the basis of agreements with the IAEA, which must be reached within a set period (18 months). At

the time the Treaty was signed (1968), however, none of the safeguards procedures required under the Treaty were available to the Agency. Work on drafting a model NPT safeguards agreement began only after the Treaty had come into effect and took nearly a year. Moreover, before the safeguards could be put to practice, the parties were also required to coordinate the so-called subsidiary arrangements and facility attachments. In practice, Agency safeguards only began to be implemented in the states of the European Atomic Energy Community, for example, in 1979. The underlying and binding nature of the Treaty is also evident with respect to other of its provisions: Article VI deals with disarmament, Article III, Paragraph 2 establishes fissionable material safeguards, and a number of others as well.

CHAPTER 22

PRECISION-GUIDED CONVENTIONAL WEAPONS

Yevgeny Miasnikov

The signing of the New START Treaty in Prague raised hopes that the United States and Russia would, once it entered into effect, pursue their dialogue to overcome the burdensome legacy of the Cold War represented by mutual nuclear deterrence, which to this day remains a real impediment to greater efforts on nuclear disarmament. During the upcoming stage, however, the two sides will most likely continue to be constrained by the old paradigms for defining the roles and composition of nuclear weapons. Thus, in reviewing the possibilities for subsequent strategic arms reductions, one main criterion will continue to be the survivability of the future strategic forces under any conceivable event scenario. This conclusion is particularly applicable to Russia, where for nearly two decades doubts have been raised about the survivability of the country's strategic forces.

The counterforce capabilities issue has been a continual topic in previous bilateral strategic arms negotiations. The survivability of strategic forces is affected by such factors as nuclear arms that may effectively disable fixed and mobile ICBM launchers. However, conventional weapons may also threaten the survivability of strategic forces, particularly if they possess **stealth capabilities, high precision, and lethality**, and could reach their targets relatively quickly. Today, this class of weapons includes long-range sea-launched and air-launched cruise missiles (SLCMs/ALCMs) and powerful air bombs and guided missiles, which can be delivered by U.S. heavy bombers and tactical aviation deployed close to Russian territory. In the future, ICBMs and SLBMs, as well as hypersonic glide vehicles, could be fitted with conventional warheads. These weapon types will be referred to in the present article collectively as “precision-guided weapons” (PGWs).¹

A number of experts believe that PGWs pose a greater threat to the survivability of Russian SNFs over the medium term than do

ballistic missile defenses, since over this timeframe no technological breakthroughs are anticipated that could significantly improve the effectiveness of BMD against ICBMs, while at the same time the United States has already amassed a considerable counterforce capability for its PGWs, which in the future will only grow.²

The decisions currently being made by the United States with respect to the development of its armed forces have served only to reinforce Russia's concerns. Recent U.S. Department of Defense policy papers have emphasized the development of precision-guided weapons and their supporting information technology and infrastructure. U.S. military doctrine has also been gradually shifting from a reliance upon its nuclear arsenal to precision-guided conventional weapons.³

One rather striking example of this trend can be seen in the appearance of the Global Strike strategy, which provides for maintaining a capability to conduct rapid, remote high-precision strikes against remote targets anywhere on the globe.⁴ Under this new concept, some strategic delivery systems have currently been reconfigured for "non-nuclear" missions. Programs for converting U.S. strategic bombers to such missions have existed since the 1990s. In 2008, work was completed on refitting four Ohio class nuclear-powered submarines to carry long-range SLCMs. Each submarine is capable of carrying up to 154 Tomahawk SLCMs. The stealth capabilities of the Ohio class submarines and the lack of reliable technical means for detecting SLBMs at launch or in flight, as well as the increased destructive capability of the prospective types of Tomahawk cruise missiles, suggest that even with conventional warheads, these systems may have a significant counterforce capability, and thus evoke natural concern among the Russian expert community.⁵ The U.S. Navy and Air Force are currently carrying out scientific research projects aimed at developing effective conventional warheads to be used for arming strategic ballistic missiles, and only restrictions imposed by the U.S. Congress have prevented the full-scale deployment of such weapons.⁶ According to documents published in February 2010 (the U.S. Defense Department's Quadrennial Defense Review Report and the proposed annual Defense Department Budget for Fiscal Year 2011), this trend will accelerate.⁷ The April 2010 Nuclear Posture Review Report also underscored the need to develop non-nuclear strategic weapons.⁸

In his well known policy address delivered in Prague on April 5, 2009, not long after he had assumed office, U.S. President Barack Obama announced that the goal of the United States was to free

the entire world of nuclear weapons. Many Russian experts interpreted this appeal as being nothing other than a U.S. attempt to secure strategic invulnerability for itself and to conduct a more aggressive foreign policy in light of the **overwhelming conventional weapons superiority** that the United States already enjoys over other nations.⁹

One of the most important tasks facing the Soviet Armed Forces since at least the early 1980s was to defend the nation's strategic forces against the threat of enemy attack involving conventional weapons delivered through the air and space.¹⁰ Over recent years, such dangers have also been highlighted in documents that define the positions of the military and political leadership in the Russian government. Both the Russian National Security Strategy to 2020 and the Military Doctrine of the Russian Federation (approved in 2009 and 2010, respectively) identified deployment of strategic conventional precision-guided arms as one of the main military threats facing the Russian Federation, **along with the development and deployment** of strategic missile defenses and the militarization of space. At the same time, the Military Doctrine notes that one characteristic feature of contemporary military conflicts is a **massive use of weapons** and military equipment based on new physical principles that are comparable to nuclear weapons in terms of effectiveness.

The Counterforce Capabilities and Development Outlook of U.S. Precision-Guided Weapons

In previous works, **the author has examined in some detail the existing** U.S. precision-guided weapons that might possess counterforce capabilities.¹¹ Such weapons systems would include a broad range of weapon types, from laser-guided bombs to long-range, air-launched and sea-launched cruise missiles, and could be delivered either by strategic delivery vehicles (such as heavy bombers or nuclear submarines) or non-strategic ones (tactical aviation and combat ships). As these assessments show, by 2015 the U.S. armed forces could potentially maintain some 130 delivery vehicles (B-2 and B-52 heavy bombers and nuclear-powered attack submarines armed with long-range SLCMs) capable of covert strikes. Overall, these systems could potentially deliver around 3,000 high-precision weapons to their targets. The potential range of PGW delivery vehicles capable of challenging Russia's strategic nuclear forces may very well increase by several

fold in the future if Russia's air defense and antisubmarine capabilities should decline to a level that could allow an adversary to establish dominance over the air space or at sea near the country's borders. In such a case, Russia's strategic sites could also be subject to attack by B-1B strategic bombers, sea-launched SLCMs, U.S. naval carrier aviation, and NATO's tactical aviation (if based in the Baltic region or the Transcaucasus). Even B-1B strategic bombers alone would be capable of delivering some 1,600 PGWs to their targets.

A review of the U.S. Department of Defense's ongoing weapons development programs that are being conducted under the Global Strike strategy is presented below.

In October 2002, the U.S. Strategic Command (STRATCOM), which historically had only been involved in nuclear planning, merged with the U.S. Space Command (SPACECOM), with the resulting agency gaining much broader functions, including to maintain a capability of conducting rapid, remote high-precision kinetic (both conventionally armed and nuclear) and non-contact strikes (using space or information weaponry) against targets anywhere on the globe.¹² The Global Strike strategy was developed with this very mission in mind.

According to the Global Strike strategy, the United States could face an urgent need to launch a pre-emptive strike in order to quickly destroy a limited number of either stationary or mobile targets lying beyond the reach of forward deployed forces (regionally deployed Air Force and Navy tactical aircraft). For example, ICBMs and SLBMs could deliver their payloads nearly anywhere in the world within just 30 to 40 minutes. It would take substantially longer to plan and conduct such missions using tactical aircraft and would require the permission of neighboring states to overfly their territories. Moreover, tactical aircraft would also be vulnerable to the actions of the air defenses of the country under attack.

Potential targets that are usually mentioned for the systems being developed under the Global Strike strategy are anti-satellite and air defense systems, ballistic missiles, and sites containing weapons of mass destruction (WMDs), as well as such targets of strategic significance as the adversary's command structure.¹³ This list of targets could also be expanded to include terrorist bases or stocks of WMDs or their delivery systems under their control.

It should further be noted that within the framework of the Global Strike strategy, the Pentagon is also considering using its non-nu-

clear capabilities against strategic targets that had previously been targeted by nuclear weapons.¹⁴ The experts believe that between 10 and 30 percent of such targets could potentially be destroyed through the use of non-nuclear strategic weapons.¹⁵

Implementation of the Global Strike strategy began in August 2004 with the approval by the chairman of the Joint Chiefs of Staff of CONPLAN 8022, which presented conceptual contingency plans for conducting preemptive attacks against targets of a likely opponent, with individual missions developed during the Global Lightning 06 strategic training exercises conducted in October 2005.¹⁶

In order to apply the goals of the Global Strike concept, strategic delivery vehicles are considered from the standpoint of both their current configuration and their potential new configuration (SLBMs and ICBMs armed with non-nuclear warheads, CAV-type maneuverable hypersonic flight vehicles, and such non-kinetic weapons as lasers, high-power microwave weapons, and information warfare). The ballistic missiles currently in service in the United States are capable of delivering only nuclear warheads, which severely narrows the selection of potential scenarios available to Global Strike. For this reason, the strategic command structure over the past few years has lobbied for accelerating the development of conventional-type warheads that could be precisely delivered to remote targets using such systems as SLBMs, ICBMs, and hypersonic flight vehicles, a concept which has been named Prompt Global Strike (PGS). Over recent years, the development of this concept of PGS has been subjected to significant changes due both to delays in the scientific research and development work, and to Congressional unwillingness to fund the wide-scale production and deployment of such systems. On the whole, Congress has been receptive to the declared need for the military command to have the means to rapidly deliver non-nuclear strategic strikes in remote spots anywhere on the globe. However, programs dealing with the refit of ballistic missiles with non-nuclear warheads continue to encounter quite strong resistance from opponents, who argue that it would be difficult to distinguish between launches of ballistic missiles configured for non-nuclear warheads and launches of ballistic missiles armed with nuclear warheads, and that this could provoke other countries to respond with a nuclear strike. This would be particularly true for the non-nuclear SLBMs slated for deployment on strategic submarines that carry nuclear missiles as well. For this reason, Congress has thus far elected to continue

financing the research programs while reducing funding for deployment preparation.

After the new U.S. administration announced its course to be toward the elimination of all nuclear weapons on the planet, the PGS concept gained new impetus for development. The Quadrennial Defense Review Report published in February 2010¹⁷ placed an emphasis on continued development along PGS lines, although in contrast to the review of 2006 it did not spell out which particular strike forces would be deployed first. The Pentagon's research and development budget provides for major spending increases through 2015, which will nearly triple the program's current expenditures.

Non-nuclear ICBMs. For several years, the U.S. Air Force has been developing the concept of using ICBMs in non-nuclear configuration under the Conventional Strike Missile (CSM) program. Although initially not a priority compared to other PGS programs, by mid-2008 this program had come to the forefront.¹⁸

As a source of potential delivery vehicles, the plan also considered the option of deploying decommissioned Minuteman II and MX ICBMs, which in their non-nuclear configuration have been given the code names Minotaur II and Minotaur III, respectively.¹⁹ Rather than deploying these missiles at existing ICBM bases, the plan would place them in undefended locations along the East and West Coasts,²⁰ such as Cape Canaveral Air Force Station in Florida or Vandenberg Air Force Base in California. This would enable the U.S. Air Force to meet several objectives simultaneously: to make launches of non-nuclear ICBMs clearly distinguishable from launches of ICBMs armed with nuclear warheads; to avoid having the separated stages of ICBMs fall onto Canadian or U.S. territory (as would happen if they were launched from current bases); to move ICBM deployment sites closer to their potential targets (particularly North Korea and Iran); and, to the extent possible, to avoid having the missiles overfly Russia or China on the way to their targets.

Among the advantages of using ICBMs for PGS operations compared to SLBMs is their greater level of command expeditiousness in executing orders to attack. In contrast to SLBMs, the MX ICBMs are able to carry larger payloads.²¹ Also, basing "conventional" ICBMs separately from ICBMs armed with nuclear warheads would theoretically make it feasible to differentiate between launches of such missiles, which would not be possible for missiles launched from submarines.

By early 2009, consideration centered on three alternative weapons configurations for the intercontinental CSMs that could be implemented over the short term.²² The first version, proposed by Textron Systems, was **the modular BLU-108 consisting of 10 cartridges**, each of which would contain four further shaped-charge smart Skeet submunitions. The second option, named “Rods from God,” was proposed by Sandia National Laboratory and involved the use of high-mass, high-density metal rods of tungsten or uranium possessing great kinetic potential. Each warhead delivered by an ICBM would contain several such rods, which would be released upon reentry into the denser layers of the atmosphere to carpet the target area. The third option, called “Hell Storm,” was proposed by Lawrence Livermore National Laboratory and involved warheads containing earth-penetrating elements. In 2008, the Johns Hopkins University Applied Physics Laboratory signed a contract with the Department of Defense to evaluate the effectiveness of each of the three warhead designs for Global Strike operations. Nevertheless, the proposal from Lawrence Livermore National Laboratory has been slated for flight testing and effectiveness evaluation beginning in 2010 or 2011. The U.S. Air Force had planned to begin deploying intercontinental CSMs no later than 2015,²³ although experts have admitted that this might not happen before 2017.²⁴

Hypersonic Glide Vehicles. In the more distant future, ICBMs may also deliver the highly maneuverable guided hypersonic glider (engineless) vehicles known as the Common Aero Vehicle (CAV), first developed in 2002 under the U.S. FALCON (Force Application and Launch from Continental U.S.) program jointly by the U.S. Air Force and the DARPA agency. The CAV **would be able to alter** its flight path perpendicularly to its ballistic trajectory by as much as 5,500 kilometers and would carry a weapons load of around 450 kilograms. In particular, they are expected to be able to carry modular warheads with self-guided elements (such as the BLU-108) or penetrating projectiles able to destroy targets deep underground due to their high speed (up to 1.2 kilometers per second at impact with earth).²⁵

When it passed the 2005 budget, the U.S. Congress prohibited any further research into the project (in either its nuclear or conventional configurations) until measures are adopted to remove any potential misinterpretation by third countries of a CAV attack. The Congress also prohibited any testing or research activities

related to the vehicle's potential deployment on ICBMs or SLBMs. This required structural changes, as well as a name change, from the CAV to the Hypersonic Glide Vehicle (HGV).

The project is currently at the stage of completing preparations for test launching the two HTV-2 hypersonic test vehicle prototypes aboard Minotaur IV Lite boosters at Vandenberg Space Launch Complex. The glider vehicles must be able to travel at over 15 to 20 times the speed of sound and reenter the atmosphere at altitudes of 50 to 70 kilometers. These experiments are intended to check the durability of the vehicle's thermal insulation, as well as the reliability of the navigation and guidance systems during prolonged hypersonic flight. For the first flight, the hypersonic vehicle (the HTV-2A) "will fly essentially straight downrange, while HTV-2B will travel along more of a curved trajectory to test the vehicle's ability to maneuver significantly cross range."²⁶ The HTV-2 tests have been delayed repeatedly; as of February 2010 they were scheduled for the third quarter of fiscal year 2010 and the second quarter of fiscal year 2011, respectively.²⁷ In June 2008, Lockheed Martin signed a contract to modify the HTV-2 to equip it with a warhead. The modified vehicle is due to undergo testing in 2012.²⁸

In parallel with the Hypersonic Glide Vehicle project, research and development is also being pursued on the Advanced Hypersonic Weapon (AHW) program, which is also intended to create a hypersonic glide vehicle able to deliver payloads of up to 450 kilograms over intercontinental distances. This project is a joint effort by the U.S. Army and Sandia National Laboratory, and it is seen as being a fall-back option with regard to the HGV. It is anticipated that the glider would be launched from forward positions (Guam or Diego Garcia) using launch boosters developed by Orbital Sciences Corporation for its GBI (ground-based interceptor). Since the ICBM together with the hypersonic vehicle it would carry would weigh only about 20 tons, it is believed that they could be transported by air.²⁹ Testing on the AHW prototype has been scheduled for the third quarter of fiscal year 2011. This vehicle will be launched from the Kauai Test Facility in Hawaii on a STARS booster, such as has already been used to launch the target missiles for the Missile Defense Agency's GBI interceptor missile tests.³⁰

Non-nuclear SLBMs. The United States has been interested in arming its SLBMs with conventional warheads to destroy hard and deeply buried targets since the 1990s, when it concluded that

the delivery accuracy needed to be much greater in order for them to be effective.³¹ The draft U.S. Department of Defense budget for fiscal year 2003 submitted to Congress for approval included the Enhanced Effectiveness (E2) Initiative, which was expected to be conducted over three years, culminating in early 2007 with full-scale flight testing. However, in both 2003 and 2004 Congress refused to allocate funds for the program, and the Navy subsequently dropped it from its budget request, although Lockheed Martin has continued the research at its own expense.

E2 had been designed to combine the existing inertial guidance system of the Mk4 warhead with a system for adjusting the flight path based upon data received from satellite radionavigation global positioning system (GPS) technologies to achieve a delivery accuracy for the Mk4 of up to 10 meters for stationary targets.³² Other data suggest that this research program pursued more modest purposes: to expand the spectrum of missions available to the W76 nuclear warhead by improving its accuracy.³³ As part of this research, Lockheed Martin carried out two flight tests using the Trident SLBM. During the experiment conducted in 2002, the practical possibility of improving delivery accuracy through aerodynamic steering during its reentry into the atmosphere was demonstrated. According to a company representative, the second experiment, conducted in early 2005, showed that it was possible not only to steer toward a target with improved accuracy, but also to slow the warhead down and “control the impact conditions.”³⁴

The U.S. 2006 Quadrennial Defense Review set a deadline of two years to equip the Trident SLBM with conventional warheads.³⁵ That same year, the U.S. administration included the corresponding Conventional Trident Modification (CTM) program in its draft budget for 2007, designed to arm two of the 24 SLBMs carried by each ballistic missile submarine with non-nuclear warheads. Under the Navy’s plan, each “conventional” Trident would carry up to four modified non-nuclear Mk4 warheads.³⁶ Two types of non-nuclear warheads would be developed. One type would be a metal slug that would land with such tremendous force it could smash a building. The other type of warhead would be a flechette bomb, which would disperse tungsten rods to destroy mobile vehicles and less well-protected targets over a broader area.³⁷

Advocates of fitting SLBMs with non-nuclear warheads have cited a number of advantages over ground-based ICBMs:³⁸

- SLBMs can be deployed closer to their potential targets than ICBMs, thus reducing flight time;
- unlike the ICBM, SLBM flight paths can be chosen in such a way as to preclude overflying the territory of countries for which such launches could be of concern or even provoke an untoward response. In particular, in an attack against potential targets in North Korea or Iran, land-based ICBMs launched from their current locations of deployment would inevitably fly over Russian territory;
- the relative flexibility of SLBMs in the selection of an optimal flight path also makes it possible to minimize or even altogether exclude incidental damage associated with spent missile stages falling in third countries;
- the Trident enhanced effectiveness program has been developed in more technical detail than the similar program for the Minuteman ICBM; thus, results could be expected more rapidly;
- unlike Minuteman ICBMs, Trident II SLBMs continue to be mass produced; thus, their modification would involve lower costs.

One central technical issue that has continued to complicate the use of ballistic missiles is the need for greater accuracy in delivering conventional warheads to target. According to experts, the existing inertial guidance systems of the Trident II missile can provide a circular error probable (CEP) of up to 50 meters,³⁹ which elicits some doubt. Although accuracy of this degree might be adequate for neutralizing soft targets over wide areas or carrying out strikes using non-kinetic weapons, it would need to be enhanced by an order of magnitude in order to attack individual targets, especially deeply buried hard targets.⁴⁰ **The accuracy of warheads delivered by missile can be improved** using a GPS signal during the terminal flight phase to make corrections to the flight trajectory, and this was the way the problem had been posed to developers.⁴¹ However, the trajectory correction method suffers from a fundamental drawback in use. During reentry and braking, the reentry vehicle carrying the warhead is enveloped in a layer of high-temperature plasma that completely blocks GPS radio signals. How close U.S. developers have come to solving this problem is difficult to say. According to U.S. Strategic Command Chief General Cartwright, the accuracy achieved during test launches of ballistic missiles has been five meters.⁴² These figures would most

likely only apply to short-range tests, where the speed of the warhead at reentry is relatively low and the portion of the flight path over which GPS signals are inaccessible is correspondingly short. A statement made by one of the participants in the March 2005 Trident II test launch indirectly confirmed this suspicion by reporting that the warhead had been receiving GPS signals throughout its flight path. It is known that the flat trajectory flown during this experiment was at a record low altitude for this type of SLBM (only 2,200 kilometers) and flight time from launch to warhead impact was 12 to 13 minutes.⁴³

Although the Conventional Trident Modification Program had been a top priority for the U.S. Department of Defense for a rather prolonged period, the U.S. Congress had steadfastly refused to fund the plan fully. Nevertheless, the idea of equipping SLBMs with conventional warheads continues to be discussed. In particular, the National Research Council, which had been created to evaluate potential Prompt Global Strike options, concluded that the Trident Modification Program had advantages over the other alternatives in its speed of implementation, financial cost, technical risks, and needed changes to the military doctrine.⁴⁴ Scientific research to enhance the accuracy of the conventional warheads for the Trident SLBM has continued in recent years, in spite of Congressional objections. The Life Extension Test Bed-2 (LETB-2) flight testing conducted in early September 2009⁴⁵ will be continued at the end of 2012 or early 2013. Although in its 2011 draft budget request the Department of Defense did not seek funding for the Trident Modification Program, the U.S. military command still intends to proceed with research to develop conventionally armed SLBMs.⁴⁶

Funding of PGS Programs. Before 2007, all development of ballistic missiles and hypersonic glide vehicles with non-nuclear warheads was funded through various individual Navy and Air Force programs (including the CTM and the HGV).⁴⁷ The Pentagon requested around \$208 million for these programs in its draft budget for fiscal year 2008. During discussions on the budget, Congress decided to create a separate integrated PGS program that would have coordinated the development of all PGS kinetic weapons and allocated about \$100 million for this task in 2008. At the same time, however, Congress also eliminated all funds that had been requested for the CTM program (\$126.4 million). The allocated money had been intended to fund research and development for the HGV and CSM prototypes and preparations for their flight testing. In addi-

tion, under the new program funds were allocated for the development of alternative options to support the Navy's research. In its draft budget for fiscal year 2009 the Pentagon requested \$117.6 million for PGS, but Congress approved only \$69.9 million, refusing to fund the development of a conventional warhead for the Medium Lift Reentry Body (MLRB) vehicle and flight testing of the maneuverable LETB-2 warhead. Moreover, Congress required that no less than a quarter of the allocated funds (\$19 million) be used to fund the joint U.S. Army-Sandia National Laboratory Advanced Hypersonic Weapon (AHW) program. The draft 2010 budget provided \$166.9 million for the PGS program, which was approved by lawmakers in essentially full measure.

In February 2010, the U.S. Department of Defense published its draft budget for fiscal year 2011, which indicated that it was requesting \$239.9 million for the PGS program.⁴⁸ These funds were planned for the following uses in 2011:

- continuation of the HGW program – \$136.6 million;
- continuation of the AHW program – \$69 million;
- preparation of test facilities at Vandenberg Air Force Base – \$24 million; and
- further development of the Prompt Global Strike strategy – \$10.3 million.

In the future, the Pentagon plans to substantially increase spending on this budget item. According to a most recent document, \$238.5 million will be requested for the PGS program in 2012, \$274 million in 2013, \$374 million in 2014, and \$574.6 million in 2015. Curiously, the draft 2009 budget had indicated a much more modest spending level on PGS: \$112 million in 2011, \$81 million in 2012, and \$82.3 million in 2013.⁴⁹ This apparently indicates that the U.S. Department of Defense expects to successfully conclude PGS research and development and begin deployment of strategic weapons armed with non-nuclear warheads.

The Counterforce Potential of PGWs: What the Foreign Experts Think

By contrast with the Russian experts, only a few of their American colleagues share the view that conventional weapons must be taken into consideration in future reductions of strategic offensive weap-

ons. This can be partially explained by the fact that over the past twenty years there has been no discussion in the United States on the issue of the survivability of strategic nuclear forces. There was a common perception that the U.S. strategic forces were survivable, simply because strategic submarines are invulnerable. For this reason, Russian concerns have frequently not been fully comprehended in the United States. Nevertheless, it must be noted that there have been a number of papers published in recent years by U.S. experts in which they have attempted to quantify the counter-force capabilities of certain PGWs.

In particular, Dennis Gormley examined the threat posed to silo-based ICBMs by the Tomahawk missile,⁵⁰ admitting that neither Russia nor the United States have the kind of air defense systems that would allow them to reliably detect such missiles at launch from a submarine or in flight. Nevertheless, he concluded that Tomahawk cruise missiles do not represent a threat to silo launchers for two reasons: the warheads that the Tomahawk delivers are incapable of effectively disabling silo launchers; and the range of the cruise missiles is too short to attack all missiles in silo launchers deployed within the borders of the Russian Federation.

While it is possible to agree with Gormley's conclusion that high-explosive blast fragmentation or combined effects submunitions pose no threat to silo launchers, the paper does not mention the fact that the U.S. Navy is currently pursuing the Joint Multi-Effects Warhead System (JMEWS) program aimed at developing a tandem shaped charge warhead for the Tomahawk sea-launched cruise missile.⁵¹ Although the warheads of guided anti-tank missiles based upon this principle weigh only a few kilograms, they are capable of penetrating armor that is more than a meter thick. Although publically available documents say little about the destructive power of large shaped charge effect weapons, it is known that they are being developed. In particular, Lawrence Livermore National Laboratory successfully tested a fairly large shaped charge warhead in 1997 that was able to punch a 3.4 meter-long hole in armor plate.⁵²

In defending his conclusion that conventional Tomahawk cruise missiles would be technically unsuitable for use in a first strike against Russian land-based missiles, Gormley also asserted that the 2,500 kilometer maximum range of these missiles would allow them to reach only nine of the 14 Russian ICBM deployment ar-

eas (see Figure 2). At the same time, the author made the assumption that the Ohio class nuclear submarines carrying cruise missiles would remain confined to an area just outside the 200-mile exclusive economic zone of any of the region's nations.

The reliable detection of modern strategic nuclear submarines, particularly in shallow waters, represents a fundamentally complex problem.⁵³ It is interesting that the Soviet Navy, the second largest in the world, has never had the ability to reliably monitor its underwater environment under any weather conditions, even within the 12-mile zone, as evidenced by the numerous collisions between submarines. Over the past two decades, the Russian Navy has not improved its effectiveness in controlling the situation under the sea surface. Thus, the assumption that a disarming strike against Russian ICBM deployment sites would come from beyond the 200-mile limit is not completely convincing. In fact, considering the actual state of affairs when it comes to Russian capabilities in defending against Ohio class submarines carrying cruise missiles, the opposite is more likely: the Russian military would be more concerned about an SLCM strike coming from a minimal distance from shore. Possible launch areas for such cruise missiles are shown in Figure 3 (areas of reach are denoted with lines), which clearly demonstrates that a missile having a range of 2,500 kilometers could reach all of its potential targets.

It should also be pointed out that the flight range of a sea-launched cruise missile will depend upon the weight of its payload and its flight mode. Russian experts estimate the maximum range of a prospective advanced Tomahawk cruise missile at 2,900 kilometers.⁵⁴ Moreover, estimates made in the early 1990s for nuclear-armed Tomahawk cruise missiles suggest that they would be able to reach much farther.⁵⁵

A recently published paper by Kier Lieber and Daryl Press⁵⁶ evaluated the effectiveness of the GBU-32 guided air bomb⁵⁷ armed with BLU-109 penetrating warheads in attacking ICBM silos. The BLU-109 penetrator is a concrete-piercing projectile weighing about one ton in a high-strength steel case filled with 243 kilograms of the AFX 70B explosive.⁵⁸ The authors considered a scenario in which the bombs would be delivered to their targets aboard B-2 strategic bombers, which are difficult to detect by radar. Although Lieber and Press concluded that a direct hit by such a bomb on the cover of a missile silo would be able to disable it, the arguments used to support their case can hardly be considered technically valid. The problem is

that the article attempted to apply criteria that had been previously used to assess the ability of a silo to withstand a certain overpressure of a blast wave created by a nuclear explosion, where the shock wave in calculating the durability of a missile silo could be approximated as a flat wave. In contrast to nuclear weapons, conventional weapons would provide only a localized impact on the cover of an ICBM silo. In assessing the potential damage of such conventional attacks, consideration must be given to a more powerful effect than the blast wave: the kinetic impact of the penetrating warhead.⁵⁹

In addition, the authors believe that combined use of an inertial guidance system corrected by GPS satellite navigation signals would allow these air bombs to achieve a circular error probable of approximately five meters. If the GPS signals were subjected to jamming, the accuracy would fall to about 30 meters. Based on this, they concluded that during an attack by a flight of seven or eight B-2 bombers (each of which is able to carry up to eight one-ton bombs), the probability of all 20 ICBM silos being destroyed would at best be 57 percent or less, and in a situation when GPS signals are being jammed, it would be close to zero. It is important to note that this article referred only to the current capabilities of these bombs. The authors failed to note the fact that in recent years the United States has been working to modernize its air bombs by prioritizing both the improvement of resistance to interference with the functioning of the existing guidance systems and the development of new navigation and guidance systems, as well as the introduction of new guidance systems to supplement the use of an inertial guidance system over the last portion of the flight path corrected by GPS signals. Such an additional system might rely on semi-active lasers, thermal imaging, or radar. At the same time, the program has also been challenged to achieve a CEP of under three meters, irrespective of weather conditions or electronic interference. If this goal is achieved, the air bombs could be made much more effective against ICBM silos than the U.S. authors indicated.

Controlling the Development and Deployment of PGWs

Before it expired in December 2009, START I limited the numbers of ICBMs and SLBMs regardless of whether they were armed with

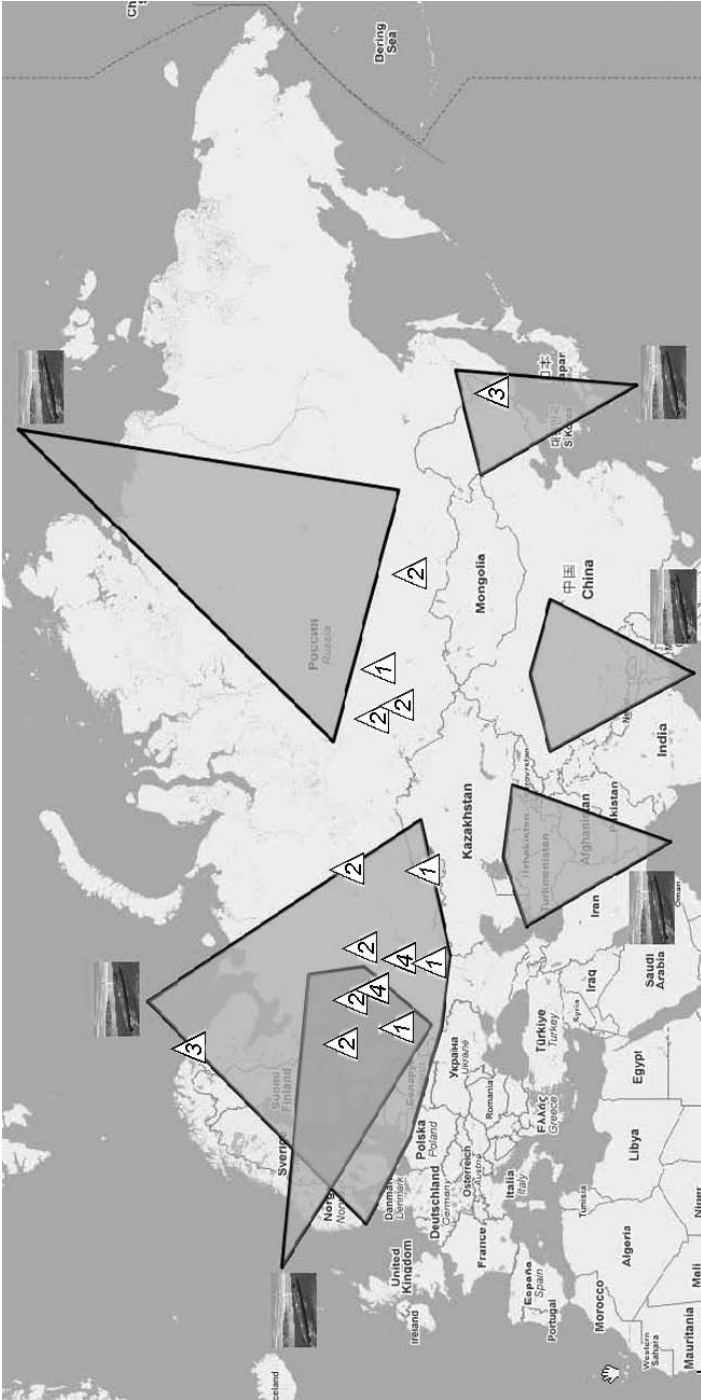


Figure 2. Potential cruise missile launch areas outside of the 200-mile zone

1 — deployment locations of ICBM silos, 2 — locations of mobile ICBMs, 3 — locations of strategic submarine bases, 4 — strategic bomber bases. The grey sectors delineate the reach of Tomahawk cruise missiles launched from Ohio class submarines in their probable patrol areas.

Source: D. Gormley, "The Path to Deep Nuclear Reductions."

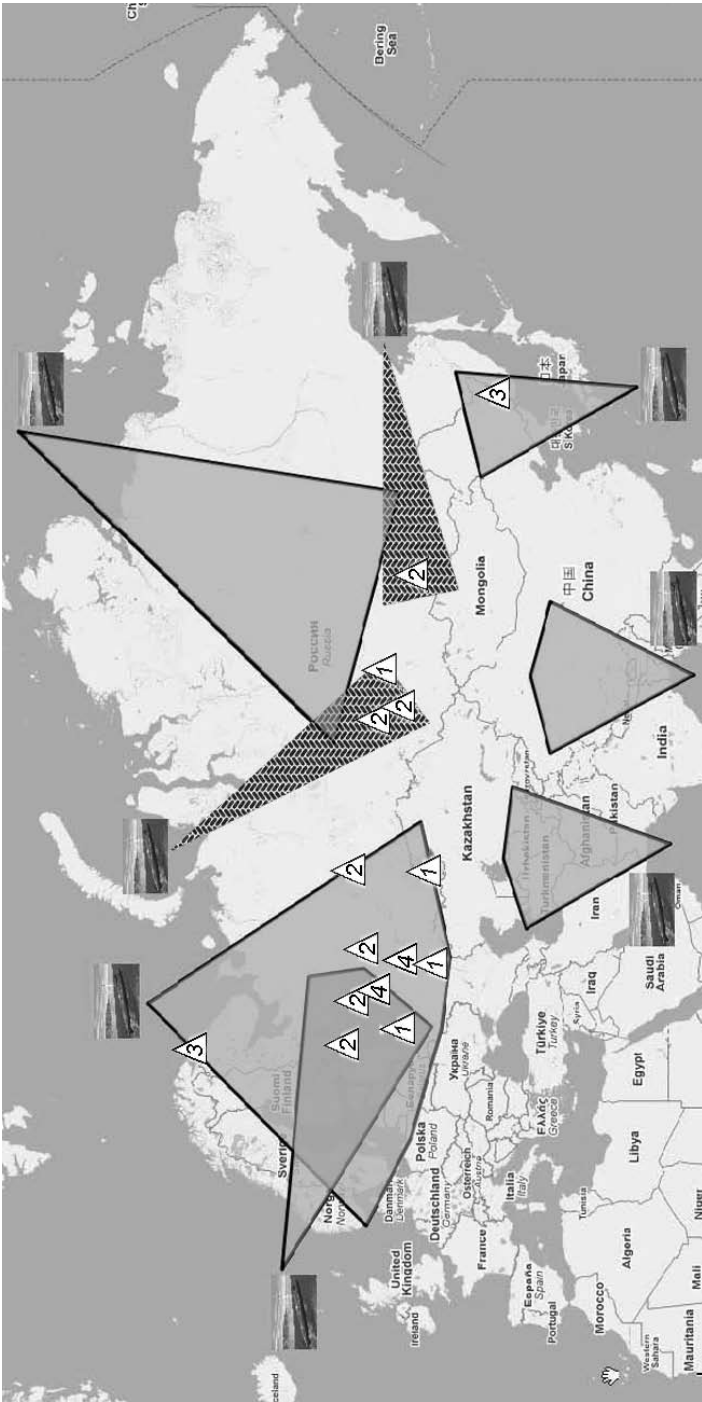


Figure 3. Potential cruise missile launch areas, including the 200-mile zone

1 — deployment locations of ICBM silos, 2— locations of mobile ICBMs, 3 — locations of strategic submarine bases, 4 — strategic bomber bases. The grey sectors delineate the reach of Tomahawk cruise missiles launched from Ohio class submarines in their probable patrol areas.

Source: D. Gormley, "The Path to Deep Nuclear Reductions."

conventional or nuclear warheads. Limitations, controls, and inspections applied to strategic weapon delivery vehicles and launchers as well: ICBMs and their launchers, SLBMs and their launchers, including launchers on those strategic submarines that had been refitted to carry long-range SLCMs, and heavy bombers, including those no longer assigned to nuclear missions.⁶⁰

The START negotiations also discussed proposals to limit PGWs, although these proposals did not come through. In particular, the Soviet Union in the 1980s (and Russia in the 1990s) suggested to the United States that the patrol areas for submarines armed with ballistic missiles and long-range SLCMs be limited, and that anti-submarine activity be prohibited near submarine bases or within ballistic missile submarine patrol areas.

The problem of the counterforce capabilities of precision-guided weapons came under discussion during the New START negotiations. In the end, the sides agreed to implement the following limitations on strategic weapons:⁶¹

- 700 for deployed ICBMs, deployed SLBMs, and deployed heavy bombers;
- 1,550 for warheads on deployed ICBMs, warheads on deployed SLBMs, and nuclear warheads counted for deployed heavy bombers; and
- 800 for deployed and non-deployed ICBM launchers, deployed and non-deployed SLBM launchers, and deployed and non-deployed heavy bombers.

As follows from the text of the New START Treaty and its Protocol, the Russian side succeeded in counting the ICBMs and SLBMs deployed in non-nuclear configuration against the allowed limits of deployed strategic delivery vehicles, and counting the non-nuclear warheads on such missiles against the allowed limits of deployed strategic warheads. Moreover, the total number of non-deployed ICBM and SLBM launchers and non-deployed nuclear heavy bombers is not to exceed 800.

However, analysis of the text of the Treaty reveals a loophole that could help the parties deploy strategic non-nuclear ICBMs and SLBMs with no limits at all. In particular, the definition presented for “non-deployed ICBM launchers” excludes “soft-site launchers,” which are defined in the New Treaty as being any land-based, fixed launcher of ICBMs or SLBMs other than a silo launcher.⁶²

At the same time, soft-site launchers are not to be counted against the numbers of deployed launchers, and this puts them outside of the Treaty's restrictions. START I expressly prohibited deploying ICBMs at soft sites, which had been a barrier to U.S. Air Force plans to deploy conventionally armed ICBMs.⁶³ This is now possible under the New START Treaty.

Although the New Treaty addresses strategic nuclear submarines refitted to carry long-range SLCMs, it also provides unobtrusive procedures that would allow converted submarines to be excluded from the overall count.⁶⁴ Moreover, under the New Treaty, individual SLBM launchers, converted in a way that precludes their use as SLBM launchers, may also be excluded from the count.⁶⁵

In contrast to ICBMs and SLBMs, heavy bombers equipped for non-nuclear armaments will not be counted against the total. New simplified procedures have been introduced for converting B1-B heavy bombers (which had been removed from nuclear missions within the framework of the January 2002 U.S. Nuclear Posture Review) into "non-nuclear" bombers.⁶⁶ Under the new nuclear posture, a substantial portion of the 76 B-52H strategic nuclear bombers will also be converted into heavy bombers equipped for non-nuclear armaments.⁶⁷

Although the New START Treaty's restrictions on strategic conventional armaments are less rigid than its predecessor's, it is worth noting that its verification system still continues to cover such armaments even after they have been removed from the count. In particular, the system provides for Type Two inspections of ballistic missile submarines that have been refitted to carry long-range SLCMs in order to ensure that the launchers on these submarines have not been reconverted and continue to be **incapable of launching** SLBMs.⁶⁸ Inspections have also been stipulated for heavy bombers equipped for non-nuclear armaments, for similar reasons.

The constructive approach taken by the two sides in preparing the New START Treaty provides grounds to believe that the dialogue begun will not merely end with the signing of the Treaty, but will turn out to be the prelude to substantive discussions on the ways to achieve *real* cuts, rather than just reductions "on paper." The previous U.S. administration, in contrast to the current administration, avoided all discussion on the subject. If such a dialogue should ever begin in depth, it would inevitably include discussions not only on nuclear strategic offensive arms but also on such matters as the problem

of ballistic missile defenses, precision-guided weapons, and non-strategic nuclear weapons, as well; in other words, all of the factors that define strategic stability will have to be taken into account.⁶⁹

Which measures to restrict counterforce capabilities of PGWs should be taken at the next stage of negotiations? First of all, it would be important to introduce limits on the numerical parameters and types of deployments allowed for precision-guided weapons, including those that had previously remained outside existing control procedures. For example, it would be possible to prohibit stationing attack aircraft within the borders of the new NATO members. Similar commitments could be undertaken by Russia in respect to its own allies in the Collective Security Treaty Organization (CSTO) and the Commonwealth of Independent States (CIS). It would also be important to limit the patrol areas of submarines carrying cruise missiles to preclude deployment by the United States and Russia of a significant portion of their submarine fleets near the territory of the other country. A measure such as this could also help to resolve the other issues that Russia had previously raised during arms reduction negotiations, such as prohibiting clandestine anti-submarine operations in ballistic missile submarine deployment and patrol areas and preventing collisions between nuclear submarines. Measures such as these would be able to alleviate Russia's near-term concerns substantially and open the way to deeper cuts in nuclear arsenals.

NOTES

- 1 The technical military literature usually defines "precision-guided weapons" as guided weapons that can disable a target, as a rule with one warhead. This definition can apply to a rather broad range of weapon types, from weapons weighing only a few grams to multi-ton guided bombs and intercontinental ballistic missiles. Within the context of the present Chapter, PGW is considered as applying to the types of guided weapons and their delivery systems that can now and could in the future threaten silo-based ICBMs, which are considered the "backbone" of the Russian Federation's Strategic Nuclear Forces.
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CHAPTER 23

SPACE WEAPONS AND THE PROBLEMS RELATED TO THEIR PROHIBITION

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There are currently over 125 countries engaged in space activity, led by the United States and Russia, with Belgium, Canada, China, France, Germany, Great Britain, Italy, Japan, and the Netherlands participating to an ever increasing extent. Argentina, Egypt, India, and Pakistan have also become more active. There are about 780 spacecraft (SC) operating in near-Earth space, 425 of which belong to the United States, 102 to Russia, and 22 to China.¹ By 2015, the number of satellites in orbit will increase by more than 400 SC.

Ensuring the security of military, dual-use, and civilian orbital systems has become an essential component of general security for nearly every developed nation. In addition to military systems operating in space, satellite systems that support telecommunications and Earth surface monitoring to provide forecasts and warnings on impending environmental or other disasters are of great importance. In light of continuing globalization, orbital systems have acquired vital significance in supporting financial and economic activities as well, since the majority of operations are now being carried out using satellite communication and data relay systems.

Space systems have also become integral to the combat capabilities of the armed forces of the leading nations. Deprived of their orbital systems, the militaries of the developed countries would find it essentially impossible to effectively pursue contemporary military activities, especially for providing intelligence, navigation, communication, and combat command. On the whole, military SC currently account for about 40 percent of the total number of satellites in orbit. The vast majority of such military satellites are from the United States, which spends far more on its military space programs than all of the other space-capable nations combined (at the current exchange rate, about 20 times as much as Russia).²

Considering the continuing high level of tension in contemporary international relations, the numerous contradictions between the political and military policies pursued by the leading nations and their allies, and the rapid pace of scientific and technical progress, it could be that the growing significance of space for military and peaceful purposes will make it the next arena for an arms race or the possible use of force. Such a path, however, would be associated with growing threats to international security and accompanied by enormous material costs, which are particularly contraindicated under conditions of financial and economic globalization.

The space environment was first used as a “transit” zone and weapons test area as early as the 1950s and 1960s, first for nuclear testing and the flight of ballistic missiles, then for their interception by ABM systems. However, aside from a few series of experiments and anti-satellite systems created and then decommissioned by the United States and the Soviet Union, full-scale weaponization of space has yet to begin, at least in terms of the actual deployment of weapons intended for use in or from space.

Humanity has reached a historic crossroads in its exploration and use of space: will space become an arena for an arms race or armed conflicts, or will it remain an area for **peaceful and only ancillary** military activity, international cooperation, and enhanced strategic stability and continuing disarmament? The choice will likely be made over the next few decades, or perhaps even years. One essential factor that will influence this choice is the continuing disparity between the United States and Russia in the extent to which space weapons of various designs have been developed and deployed, such as impact weapons in various modes of deployment to be used against spacecraft or space-based systems to attack targets in other environments. If revived and developed, such a capability could quite possibly lead in the near future to both symmetric and asymmetric countermeasures, including increases in strategic offensive nuclear weapons. Altogether, this might be capable of initiating a destabilization of the global military and political environment.

Space Weapon Development Programs: History and Current Status

The United States and the Soviet Union first began active space weapon development in the early 1960s. In content these two programs were alike in many ways.

Comparable to the U.S. Satellite Inspection Technique (SAINT) project, the Soviet Union began developing its IS (“satellite destroyer”) anti-satellite system, designed to disable critical and defended spacecraft kinetically from close operational proximity. All of the main elements of the IS system were developed by 1967, and its testing began in October of the same year. The first successful intercept mission occurred on November 1, 1968, and in February 1973 the system was designated for operational testing. The IS was capable of destroying spacecraft at altitudes of between 250 and 1,000 kilometers. The system was later modernized, and its intercept altitude was increased. In 1978 the IS-M was officially commissioned into active service. In April 1980, the Soviet Union renewed research on this anti-satellite system (under the IS-MU project), conducting over 20 full-scale experiments, 25 percent of which involved actual targets. The final test of the system was conducted on June 18, 1982.³ In August 1983, the Soviet Union announced that it “assumes the commitment not to be the first to put into outer space any type of anti-satellite weapons, that is, imposes a unilateral moratorium on such launching for the entire period during which other countries, including the U.S.A., will refrain from stationing in outer space anti-satellite weapons of any type.”⁴ The IS-MU remained operational until 1993, when Russian President Boris Yeltsin issued a decree decommissioning the system.⁵

Development of the *Kontakt* (Contact) air-launched missile system for attacking spacecraft at altitudes of up to 600 kilometers also continued until as late as the early 1990s. Plans had called for the system to be carried aboard MiG-31 fighter interceptors. However, funding ran out before testing of the deployed components could be completed.

The largest projects, which were first approved as far back as the late 1970s, involved the orbital *Kaskad* and *Skif* anti-satellite platforms armed with missile and laser weapons. Although plans had called for orbital testing of the anti-satellite missiles by around 1985

or 1986, this never occurred. The space platforms were never produced, although this was probably due to considerations of a military or political rather than technical or financial nature. The expert community succeeded in convincing the Soviet leadership that the launch of such platforms or testing of combat space systems might provoke a disproportionate U.S. reaction in the area of space weapons that would be very detrimental to Soviet interests.

As a consequence of the introduction of the U.S. Strategic Defense Initiative (SDI) program in the early 1980s, the Soviet Union accelerated its work on space weapons, although in actual fact the greater portion of work to be done in developing space weapons, antimissile defenses, and systems for overcoming ABM defenses had already been pursued at varying degrees of intensity by the United States and the Soviet Union for some 20 years.

In 1985, all of the Soviet projects were categorized as representing either symmetric or asymmetric measures, and were designated as the SK-1000, D-20, and SP-2000 programs.⁶

The SK-1000 program, which became known as the Multiple Target Combat Space System, encompassed over 20 combat space strike system development projects (DP) and approximately the same number of experimental development (ED) programs related to providing information support for space-based and land-based combat systems. A number of strike system programs produced preliminary designs, over half of which were eventually designated for additional scientific research and development (R&D) programs, and one ED project, the *Naryad-B*, an interceptor designed for launch aboard the UR-100NTTH missile to attack individual spacecraft, led to intermediate flight testing.

The D-20 program included over 170 various R&D and experimental research (ER) projects and over 60 DP projects. The most representative component of this program was the A-135 ABM system using a nuclear interceptor, although experimental research was also conducted into long-range ABMs with non-nuclear interceptors, homing devices operating in any EM band, and other areas of research. These projects did not require significant investment, were never suspended and apparently continue to this day.

U.S. plans to deploy combat systems in space prompted the Soviets to undertake development of asymmetric countermeasures against space-based ABMs. The main approach to breaching ABMs has always been based upon oversaturation of the information and fire

control components, which naturally would be accomplished through the use of the full complex of ABM countermeasures and by launching the greatest possible number of missiles. This was a function both of the total number of such missiles available in combat readiness and the survivability of their launchers under various potential types of attack.

Development scenarios for the Strategic Nuclear Missile Forces in the event of full-scale U.S. ABM deployment were considered from the aspect both of having Soviet combat systems in space and ABMs at missile bases, and of not having them. In the extreme case, the total number of launchers could be increased from 1,398 to nearly 1,700. The option of deploying up to 1,200 mobile launchers (such as the *Topol* or *Kurier*) for small ICBMs was also considered.

There are many reasons why Russia will not implement any of these large scale symmetric and asymmetric projects in the foreseeable future, including the collapse of the old Soviet development agencies and the shortage of resources. However, if the United States proceeds with the deployment of anti-satellite weapons, a certain number of these projects, especially the asymmetric projects, could still be implemented, in spite of the heavy financial burden on the budget.

The United States began working on anti-satellite systems in 1957. By 1962, it had already developed spacecraft interceptors based on the Nike Zeus and Thor missiles with nuclear warheads and deployed them at launch readiness on Johnston Island. There were two such anti-satellite systems deployed between 1972 and 1974, when they were decommissioned and mothballed.

In 1977, work began under the ASAT program on the development of a next generation MALS system, which envisioned that F-15 fighters would launch Altair short-range attack missiles armed with miniature homing vehicles (MHV) on a vertical trajectory to strike satellites directly. The reach of the complex in altitude was limited to 1,000 kilometers. This anti-satellite system passed its flight tests in space between 1984 and 1985 by destroying a real target in space. It was anticipated that the United States would be able to incapacitate between three and five low-orbit satellites (below 1,000 kilometers) every 24 to 36 hours.

In 1988, for a number of technical and political reasons, the MALS system was mothballed. It was anticipated that it could be restored to combat readiness within a matter of only months. This decision with respect to the MALS program did not mean that the United

States was altogether renouncing further development of ASAT, which included land-, air-, and sea-based systems.

Work on a new anti-satellite system began in 1989, with the main focus on developing land-based ASAT. As early as 1991, the kinetic energy anti-satellite (KE ASAT), touted as an “environmentally friendly” interceptor, was presented in the United States. It was based upon an upgraded small sized low mass Brilliant Pebbles interceptor that had been developed for SDI.⁷ Such an interceptor might have a mass of a few dozen kilograms, and was supposedly designed to avoid the formation of fragments.⁸ ASAT systems armed with such interceptors should make it possible to disable all military satellites in low orbit within a week.

There were seven flight tests planned, two of which involved actual interception of decommissioned U.S. satellites, with the other five orchestrated as near fly-bys of satellites in orbit. Deployment of the first 10 combat KE ASAT was to have begun by June 1998. Although the tests were not undertaken at that time, they were in fact completed at a later date.

Deployment of a land-based ASAT carrying such interceptors appears quite feasible. Under the George W. Bush administration, it was asserted that the system could be created very quickly once a decision to deploy had been made, in light of its close relationship and role as successor to the EKV-PLV anti-satellite system that was then being tested.

In 1990, the Rockwell International company was granted a contract to create a prototype model of a land-based anti-satellite system. It was assumed that this would be a tractor-towed mobile system having a three-stage booster. The interceptor itself would be similar in construction to the “Brilliant Pebbles” interceptor. At the initial stage of deployment, 69 or 79 anti-satellite missiles were to be acquired to equip a single battery, with two batteries of 48 launchers each planned for subsequent stages. Deployment of such anti-satellite systems capable of expeditiously dispatching targets in orbit would be possible, given the appropriate political decision.

In October 1997, the United States conducted the first series of successful real-target laser experiments using the direct effect of two bursts fired at an MSTI-3 satellite orbiting at an altitude of 420 kilometers and a elevation of 90 degrees. Analysis indicated that the energy levels achievable from this laser could, for example, disable satellite solar panels and damage optoelectronic instruments

at altitudes of between 400 and 700 kilometers and could cause complete degradation of photo receptor sensitivity in orbital early-warning and Earth surface surveillance systems at all possible orbital permutations, including the geostationary.⁹

Development also continues on the Space-Based Laser (SBL) complex, which involves an orbital anti-missile/anti-satellite platform and has an active weapons range of 1,000 to 3,000 kilometers. U.S. experts continue to view this system as a potentially effective method for defending against ballistic missiles (BM) of any range by attacking them during the boost phase of their flight trajectory (at altitudes of 10 kilometers and higher). In addition to their use as a component in the national missile defense system, SBLs also show promise as a way to destroy spacecraft in low orbit or mid-range orbit, as well as targets flying at altitudes of from hundreds to thousands of kilometers.

In 1990, there were two space laser experiments conducted (RME and LACE) that demonstrated excellent accuracy in targeting the laser beam and stability in holding the target lock. The technology was developed for adjusting the laser beam using adaptive optics to compensate for the distortion caused during its transit through the atmosphere. These experiments demonstrated the feasibility in principle of creating the systems needed for detection, tracking, guidance, and beam-control for SBLs.¹⁰

In February 1999, the U.S. Air Force contracted a group of companies (Boeing, Lockheed Martin, Space, and TRW) to prepare and conduct a comprehensive experiment named the Integrated Flight Experiment (IFX), intended to place a prototype laser weapon into near-Earth orbit. This experiment was to provide for a series of tests on the ground and in space. In 2012, the prototype laser was to have been placed into orbit at an altitude of 425 kilometers and an elevation of 28 degrees. The prototype had to have enough of the chemical reagents required to conduct three disabling bursts and 10 low-power shots.¹¹ In 2013, an experiment was planned using a laser beam to attack a target missile simulating a ballistic missile after launch. In furtherance of the SBL project, an experiment was planned for 2004 to refuel an earth satellite in orbit as part of the Orbital Express program, which was supposed to test the feasibility of recharging a simulated chemical laser in orbit to extend its service life.¹²

At the same time, notwithstanding a certain amount of progress, some difficulties have remained unresolved, such as delivering a full-

scale SBL prototype into orbit, recharging the SBL complex with laser mixture components in orbit, and others. In light of the inadequate resolution of a number of issues under the SBL development program, they were returned to the development stage of the technology.

The following anti-satellite systems are at the stage of R&D or land or flight testing and are closest to readiness:

- the modified Aegis Mk7 sea-based anti-missile system with STANDART-3 (SM-3) missiles;
- Army land-based mobile systems being developed under the KE ASAT program;
- the ABL airborne laser anti-satellite/anti-missile system;
- the MIRACLE land-based anti-satellite laser system to functionally disable vital information satellites.

The following projects are still undergoing investigative research and experimental work:

- space-to-Earth weapons;
- the SMV reusable Space Maneuvering Vehicle intended to address a broad range of missions, including attacks against satellites or ground targets from space;
- creation of space-based radio electronic countermeasures;
- creation of the technology to perform inspections in space using autonomous micro-satellites designed to protect U.S. satellites and diagnose satellite malfunctions, as well as to attack the spacecraft of a potential adversary. The ANGELS (Autonomous Nanosatellite Guardian Evaluation Local Space) program under which such work is being pursued has a dual purpose and can be used both for radio electronic warfare and for orbital defense. According to the Center for Defense Information, the autonomous micro-satellites produced under ANGELS could be equipped either with radio jamming transmitters or with devices to spray paint onto the optics of other satellites to incapacitate them. Of the various electronic warfare weapons under discussion, particular emphasis has been given to the development of high-power orbital radio frequency transmitters capable of destroying or incapacitating the electronics of space-based combat control and communications systems, as well as disabling satellites of the adversary's missile warning system.

Projects on creating the means for attacking Earth targets using weapons based in space first emerged in the United States along with

its first satellites (the FOBS project for deploying nuclear bombs in space); however, the first real designs for such a weapon did not appear until 1987. The Space-Based Ground Vehicle (SBGV) project, an orbital glider known to be intended to execute rapid and precise strikes against strategic targets (primarily mobile missile launchers or surface ships) deep within the adversary's defensive perimeter, was expected to use either inertial guidance or the Navstar system for navigating the initial portion of its flight path to target, and would then be directed to mobile targets during the second portion of its flight through tracking data received from real-time surveillance satellites. During the final atmospheric phase of the flight, the vehicle would lock onto its target using its self-guided homing warhead.

According to initially published design information, the vehicle was to have a mass of 432 kilograms, a flight range from starting point to target of 22,000 kilometers, and a minimum possible descent time of between three and five minutes. Flight testing was planned to be completed by 2002; however, no information about such testing has since appeared in any of the public sources.

It was initially planned to equip the vehicles with two types of warheads:

- for attacking poorly defended ground, sea, or air targets;
- for attacking well protected, primarily underground targets.

Although much has been published about the development of spacecraft for attacking targets deep within the adversary's territory, it must be noted that under current conditions there are serious doubts about the operational and strategic necessity of such systems. The main point is that there are no operational or strategic objectives that could be better addressed by using space-based (or semi-orbital) rather than land-, air-, or sea-based systems, especially if they are based near the borders of a potential adversary.

The United States attaches great importance to information countermeasures in or from space in approaching the issue of radio electronic warfare in space, as indirectly evidenced by the efforts that the United States has devoted to protecting its space systems against potential radio electronic countermeasures. It also appears to be the explanation for the reports published recently that the United States had begun radio electronic warfare weapon research. In materials from Senate hearings,¹³ it was disclosed that in 2004 the U.S. Air Force had established the 76th Space Control Squadron, capable

of destroying or disabling foreign satellites using ground-based active jamming stations.

In addition to the United States and Russia, China has also engaged in the development of anti-satellite weapons. Its first successful anti-satellite weapon test (after three initial failures) was reported by the media in 2007. It was established that between January 11 and January 12 China had destroyed a *Feng Yun* 1-3 satellite and recovered the debris. The satellite had been destroyed over central China at an altitude of 864 kilometers. A correlation was also discovered between the times of the destruction of the satellite and the launch of an intermediate-range ballistic missile at the Xichang Satellite Launch Center. It should be noted that the open press had presented no prior indication of any preparations for a launch from the Xichang launch pad or the testing of elements of an anti-satellite defense program, aside from reserving zones of air space and closing them to air traffic in advance. These zones were situated in such a way as to confirm that they had been associated with the detected launch of the ballistic missile. This provides a reason to suspect that the destruction of the satellite and the ballistic missile launch had been related to the development of anti-satellite defenses.

Strategic Concepts and the Interests of the Powers

Thus, within the foreseeable future, China, Russia, and the United States will have the ability to realize their current potential in militarizing space. There is little doubt that the United States leads the others in this area, since it enjoys a wealth of advanced space technology and has made enough scientific and technological progress to develop individual land-based (fixed or mobile) and sea-based anti-satellite systems, and perhaps phase them in some time after 2010.

The deployment of such weapons has been envisioned in U.S. doctrine and is grounded in the conceptual framework of U.S. space policy. The United States Space Command vision for 2020, for example, lays out the following main operational concepts:¹⁴

- develop the means and methods to establish comprehensive control of space;
- seek new forms and methods of global engagement (including the potential ability to apply force from space against any part of the world) and implement full force integration

and unifying operations between the space, land, sea, and air forces;

- roll out information technology and promising weapons systems; implement them at all levels of military operations.

Specific steps for pursuing this mission were spelled out in a January 2001 report by the Commission to Assess United States National Security Space Management and Organization (the so-called Rumsfeld Commission).¹⁵ The main points of this report represented a detailed program leading to U.S. dominance in space.

The main preconditions for the new initiatives for the weaponization of space and full-scale development of ABM systems reduced to the following:

- the potential for nuclear proliferation, especially of nuclear-armed missiles;
- the trend toward blurring the lines between the military and civil use of space;
- the technical commonality of efforts in developing and producing anti-missile and anti-satellite systems;
- a decline in Russian space activity and increase in space work by countries currently or potentially hostile to the United States.

In January 2001, the Congressionally authorized National Space Commission strongly recommended that the United States maintain an ability to deploy weapons in space, identifying three potential mission goals that such weapons would address:

- defense of current U.S. space systems;
- interference with an adversary's use of space or space systems;
- delivery of strikes from space against any target on land, sea, or air.¹⁶

On August 31, 2006, the new U.S. national space policy was signed by the president. This document replaced Presidential Decision Directive NSC-49/NSTC-8 (the National Space Policy of the United States of America) of September 14, 1996 and defined the main principles and objectives of U.S. space activity.¹⁷

In particular, it established the responsibilities and duties of the U.S. Department of Defense as follows:

- support and enable defense and intelligence requirements and operations during times of peace, crisis, and through all levels of conflict;

- develop and deploy space capabilities that sustain U.S. advantage and support defense and intelligence transformation;
- maintain the capabilities to execute the space support, force enhancement, space control, and force application missions;
- provide space capabilities to support continuous, global strategic and tactical warning, as well as multi-layered and integrated missile defenses;
- develop capabilities, plans, and options to ensure freedom of action in space, and if directed, deny such freedom of action to adversaries.

All of the above points with the exception of the last can be said to apply to military space support systems. However, the requirement to ensure freedom of action in space and deny such freedom to an adversary could only be accomplished by implementing a portion of the previously described U.S. programs to attack or disable the spacecraft of other nations. Still, these requirements do not go as far as the above-mentioned Congressional Commission recommendations that appeal for the ability to deploy weapons in space.

In light of financial limitations and administrative and technical difficulties with its military industrial complex, Russia's current military space programs doubtless lag well behind those of the United States both in scope and in level of development. However, insistent recommendations that Russia pursue the means to conduct armed combat in space are not infrequent.

Appeals that Russia develop its own weapons for an anti-satellite system (which is probably not what the authors of the above recommendations had intended) are probably grounded in the long history of U.S.-Soviet negotiations, when the United States would agree to limit its own arms systems in exchange for similar limits on Soviet systems, and vice versa. In other words, it was actual systems that were being traded, rather than declarations or development plans. However, considering the current economic conditions, Russia should be extremely cautious in relying on this experience, so that an arms race in space does not become unavoidable.

There is no doubt that the United States has deployed the greatest number of military, commercial, and scientific "assets" in space. In particular, both strategic and general purpose forces depend to an ever increasing degree upon the proper functioning of various satellites, which applies much less to the situation in China, Russia, or other military powers of the world. Consequently, the United

States has to be far more interested than other countries in, first, ensuring the security of its own orbital systems, and second, ensuring the security of its own SC rather than threatening the satellites of other countries.

This apparently explains why the United States, after leaping so far ahead of other countries in the level of development and diversity of its military space programs, has limited itself to conducting only a handful of experiments and tests over the 1980s and over the past decade, including the 2008 satellite intercept test. Although Washington has decommissioned its older space defense weapons, it has not deployed any new space weapons systems, relying instead on the strategic and tactical anti-satellite “side benefits” of the ABM program (the Ground-Based Interceptor, the Aegis and SM-3, airborne lasers, etc.).

Behind this lies a rather pragmatic calculation of the potential gains and losses from engaging in a broad-based anti-satellite arms race with China and Russia, and subsequently with other potential space-capable nations. The inherent vulnerability of satellites (they have predictable orbits and are difficult to camouflage or defend using passive means) and the much greater reliance of U.S. strategic nuclear and general purpose forces on orbital support systems render the United States vulnerable to ASAT deployments by other nations, even if such systems are less effective. Moreover, this may not remain a purely Russian or Chinese effort, as was the case with nuclear weapons and missile technology proliferation. In spite of its initial enormous lead in this area, the United States now views such proliferation as one of the greatest threats to its security.

Russia relies to a lesser degree on orbital elements in operations by its general purpose forces, although it does plan to expand its assets in space significantly. Chinese interests are objectively similar to those of Russia in this respect, although the priorities may differ slightly. China is, for example, probably less concerned than Russia about new U.S. general purpose weapons, but it may be far more concerned than Russia about U.S. plans to build a multi-phase regional ABM system in light of its relatively limited nuclear deterrent capability.

This makes it likely that both China and Russia will develop an interest in pursuing their own anti-satellite systems in asymmetric response to the new U.S. general purpose and anti-satellite weapons. It would be fair to ask: why then does the United States not

take the initiative to legally prohibit anti-satellite systems, instead of opposing any serious negotiation on the subject and continuing to pursue ASAT system testing and deployment?

The answer appears to include a number of considerations, at least for the Republican administration of 2001-2008:

- The United States is apprehensive that ASAT limitations or prohibition would complicate its development of space-based ABMs due to the broad technological overlap in systems and components between the two;
- U.S. anti-satellite weapons are being developed as a deterrent against similar systems being deployed in the distant future by China and Russia;
- ASAT systems are seen as providing active defense for U.S. spacecraft, including orbital ABM platforms, against the pre-orbital and orbital anti-satellite systems of other nations;
- The United States believes that under a worst case scenario, its military supremacy in space would remain overwhelming, even if an all-out space arms race breaks out for various types of weapons with various purposes.

The extent to which these concepts remain viable over the short term and U.S. plans and specific programs for the militarization of space are realized will depend upon the policies of the new administration in this area.

The new Obama administration's Space Posture Review had not yet been published when this portion of the present book was submitted, and it was still not clear which space programs might be shut down, suspended, or continued. Based upon preliminary information, the United States intends to continue testing its X-37B orbital vehicle, which eventually will be capable of replacing satellites destroyed by enemy action and perform other functions, such as rapidly executing attacks against targets on Earth.¹⁸ At the same time, however, initial information suggests that the new space policy will focus on international cooperation and the development of a code of conduct for space.

It is possible that the great foreign policy failures and difficulties, together with the financial and economic crisis (unprecedented since the 1920s), will require the new U.S. administration to seriously reconsider its military space policy. In expressing this expectation, two respected U.S. analysts emphasized: "The United States has made

the greatest investment in space assets and is substantially dependent on them for conducting global military operations. The potential vulnerability of these assets to relatively unsophisticated attack presents a more significant threat than any other military establishment encounters in space... A ban on space weapons would disproportionately benefit the United States, which therefore has the strongest reason to set and maintain exacting standards of verification."¹⁹ It seems inevitable that these expectations will meet resistance, not only from the inertia of current ASAT development programs, but also from the powerful corporations of the military-industrial complex. That makes it all the more essential that an active policy be pursued that results in actual steps being taken to prevent the weaponization of space. What is especially needed is the development of (and subsequent comprehensive agreement on) **a prohibition on the deployment of space-based weapons that strike targets on land, in the air, in the water, and in space, as well as prohibiting attacks on spacecraft with land-, sea-, or air-based weapons.**

Draft Treaties, Topics of Negotiation, and Particulars of Verification

Under current laws on space, no weapons are prohibited from being deployed in space except for weapons of mass destruction; neither are there any restrictions on the development, testing, or deployment of anti-satellite weapons in space. The U.S. withdrawal from the ABM Treaty in 2002 has left behind **no limitations on the creation, testing, or deployment of ABM systems or their components in space.** There are no prohibitions on any anti-ABM systems or weapons, active or passive satellite defenses, optical electronic or radio electronic countermeasures, or experiments of any kind having military application in space (**unless they relate to hostile modification of the natural environment**).

On February 12, 2008, China and Russia jointly submitted a draft of the Treaty on the Prevention of the Placement of Weapons in Outer Space, the Use of or Threat to Use Force against Outer Space Objects (PPWT) to the Geneva Conference on Disarmament, which had been discussing this problem for over five years.

A proposal to begin developing a comprehensive agreement on the non-deployment of any type of weapons in outer space and

on the non-use or threat of force against objects and to enact a moratorium on deploying weapons in outer space, pending a relevant international agreement, was advanced in a speech by the Russian minister of Foreign Affairs at the 56th Session of the General Assembly of the United Nations on September 24, 2001. On June 27, 2002, the United States and Russia presented a document entitled *Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects* to the Geneva Conference. During 2004 and 2005, China and Russia submitted materials to the Conference on Disarmament related to norms in international law regulating military activities in space. In 2008, a draft PPWT was submitted with a research mandate, in order that negotiations could subsequently be pursued at the appropriate Conference committee level when conditions permit.

For the purposes of the Treaty, the term “weapons in outer space” was defined as “any device placed in outer space, based on any physical principle, specially produced or converted to eliminate, damage, or disrupt normal function of objects in outer space, on the Earth, or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict damage on them.” At the same time, a weapon was to be considered deployed in space if it makes at least one orbit around the Earth, follows a portion of such an orbit before leaving it, or is stationed somewhere in space on a permanent basis. Thus, ballistic missiles of various classes whose combat flight paths would take them into space (such as for intercepting spacecraft) but which would never transition into near-Earth orbit would be excluded.

Under Article II of the draft PPWT, participating states undertook not to place in orbit around the Earth any objects carrying any kind of weapons; not to install such weapons on celestial bodies or station such weapons in outer space in any other manner; not to resort to the threat or use of force against outer space objects; and not to assist or encourage other states, groups of states, or international organizations to participate in activities prohibited by the Treaty. At the same time, Article IV of the draft PPWT declared the following: “Nothing in this Treaty can be interpreted as impeding the rights of the States Parties to explore and use outer space for peaceful purposes in accordance with international law, which include but are not limited to the Charter of the United Nations and the Outer Space Treaty.”

Verification of compliance with the Treaty was to be the subject of an additional protocol. The draft stated that “to facilitate assurance of compliance with the Treaty provisions and to promote transparency and confidence-building in outer space activities the states parties shall practice on a voluntary basis, unless agreed otherwise, agreed confidence-building measures.” (Article VI).

The resolution of disputes on the proper application or interpretation of Treaty provisions was to be handled in particular by the establishment of a PPWT executive organization. In the event of a dispute, the parties involved were to first engage in joint consultation in order to resolve the dispute through negotiation and cooperation. If they were unable to reach agreement after consultation, the dispute could be referred by one of the interested participating countries to the PPWT executive organization together with supporting materials (Article VII).

The Russian-Chinese initiative was generally well received by the international community, with the exception of the Republican administration in Washington.

It is also telling that the Treaty applied only to weapons deployed in space and did not include Earth-to-space systems, which are being developed most rapidly and could be brought into military operation in the near future. Instead, reference was made only to space-based ABMs and anti-satellite and space-to-Earth systems that would be developed no sooner than the distant future, if ever.

This was a significant departure from the Soviet approach of the 1980s, which was unrealistic, yet comprehensive. The reason for this appears to lie in the fact that China, and possibly Russia, have been working on land-based anti-satellite systems as an asymmetric response to a potential U.S. space-based ABM system. They also apparently intend to target U.S. space-based support infrastructure and systems that maintain the viability not only of U.S. ABM defenses but also of its ability to wage the new type of highly technological war that involves the use of massive numbers of long-range conventional precision-guided weapons. Such a selective approach, though completely understandable from a military standpoint, could hardly become a topic for practical negotiation.

In general, it could be argued that the new Russian-Chinese initiative has brought about some positive results, but only in the political and diplomatic sense, not in practical disarmament terms. This is not without its usefulness, particularly as long as the official policy

of the United States remains hostile and destructive. However, if Washington's point of view should become more constructive and the demilitarization of space should become the object of practical negotiations, including the vitally important problems of verification, China and Russia would face numerous unpleasant surprises and difficulties.

The many years of experience with previous initiatives and negotiations attest to the fact that there have been huge uncertainties and discrepancies among diplomats and experts on the very subject of regulation through legally implemented treaties. In other words, the primary fundamental objective of defining the topic of negotiations remains far from resolved.

Experts are in general agreement that arms and other weaponry in space are combat devices created and tested for striking targets from orbit (i.e., from vehicles that orbit the Earth at least once; for now, no reference is being made to any other celestial bodies or vehicles in orbit around them), as well as combat devices created and tested for attacking objects in space (i.e., objects that make at least one orbital revolution around the Earth). A simpler (though less precise) definition of space weapons is that they are combat devices that are space objects in their own right or intended to attack space objects. The Soviet Union applied just such a broad definition to the concept of "space strike weapons" as the subject of treaty negotiations in the early and mid 1980s when it was attempting to prohibit the U.S. Strategic Defense Initiative. In other words, space weapons were defined on the basis of either the location of their targets or of the deployment locations of the devices themselves.

The main nuance here lay in establishing the fundamental difference between "space objects" and "objects in space." The latter implies any object that has been placed in space or passes through space without completing at least one orbital revolution around the Earth. Unless such a distinction is drawn, any intermediate-range or intercontinental ballistic missile, or any anti-missile defense system designed to intercept its targets at altitudes of over 100 kilometers, could be considered to be space weapons, although many nations have already created such weapons and systems long ago, and they have been covered by other negotiations, treaties, and proposed agreements. However, even this consensus has done little to help resolve the problem.

A particular paradox is inherent to space weapons, in that some of them were created in the past and have since either been moth-

balled or destroyed unilaterally, while others are only at a preliminary stage of technical development. On the one hand, this does create the opportunity for prohibiting such weapons before they have been tested or deployed for combat, which may turn out to be exceedingly difficult, both from a strategic military perspective (due to their variety, asymmetry, and differing roles in the military policies of the different countries) and from the standpoint of verification difficulties (which will be addressed below as a separate issue).

On the other hand, however, it is just this early stage of technical military development that makes such weapons so difficult to define for negotiation, prohibition, or limitation. In fact, the current definition of space weapons based upon their deployment location (space) and/or the location of their targets (space) fails to consider their technical characteristics. By analogy, the difficulty that would be presented for resolving disarmament issues if the subject of agreement were to be characterized, say, as “any sea-based weapon or weapon used to disable sea targets” can easily be imagined.

Successful disarmament negotiations in the past have always been based upon quite specific fixed or mutually understood technical characteristics of the weapons systems and mutual agreement on the designation of their main types. For example, the greatest accomplishment in reducing and limiting strategic offensive weapons was START I, signed in 1991. This treaty defined one of the main subjects of agreement as follows: “for the purpose of counting a deployed ICBM and its associated launcher, a silo launcher of ICBMs shall be considered to contain a deployed ICBM when excavation for that launcher has been completed and the pouring of concrete for the silo has been completed, or 12 months after the excavation begins, whichever occurs earlier, and a mobile launcher of ICBMs shall be considered to contain a deployed ICBM when it arrives at a maintenance facility ... or when it leaves an ICBM loading facility” (Article III, Paragraph 6(d)). There is nothing like this for space weapons today, which is partially due to objective reasons.

Obviously, the Russian-Chinese draft of 2008 contained a narrower definition of what constitutes space weapons. It excluded land-based (as well as sea- and air-based) systems, and covered only space-based systems, in particular orbital systems. On the one hand, this simplified matters by sidestepping the difficult issue of differentiating such weapons from existing strategic and theater ABM systems and offensive ICBMs and IRBMs used for anti-satellite ap-

plications. On the other hand, however, in so doing it left unaddressed U.S. and Soviet Earth-to-space anti-satellite systems that had already been created and tested, as well as the anti-satellite systems currently under development and the militarily most attractive future anti-satellite systems of China, the United States, and possibly Russia and other countries.

It is specifically these systems that over the short term will probably pose the greatest threat to satellites orbiting at altitudes of 1,000 kilometers or greater. Of the satellites of various mission types and manned spacecraft, a significant portion currently occupies or will occupy such orbits, including satellites engaged in electronic imaging and radio electronic reconnaissance, communication, meteorology, and anti-missile defense (SBIRS-Low), as well as satellites following highly elliptical orbits with their perigeal segments above the Antarctic (among other things, used for communications and in missile warning systems). Most probably, space-to-Earth platforms involved in anti-satellite and anti-missile defense systems (assuming they are ever built) will also be placed into such orbits.

Such anti-satellite systems having intercept altitudes of up to 1,000 kilometers would present less of a threat to satellites in high orbit, including communications, early missile warning, and navigation satellites in geostationary or highly elliptical orbits (GPS, GLONASS, and Galileo), although a new class of ASAT might also be created within the foreseeable future that could be launched from land, sea, or air into the orbit required to threaten such satellites or be deployed near their targets in advance ("space mines"). Considering the difficulties with verification, even the reworked, second version of the 2008 draft Treaty appears rather ineffectual, while the first version simply left ASAT out of the negotiations. The same is true for potential air-, land-, and sea-based laser systems, which could attack or disable satellites in high orbits fairly effectively.

Aside from such omissions, however, the draft PPWT of 2008 also contains many uncertainties in its definition of the concept of "weapons in outer space." As has previously been noted, such weapons were defined in this document as "any device placed in outer space, based on any physical principle, specially produced or converted to eliminate, damage or disrupt normal function of objects in outer space, on the Earth or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict dam-

age on them.” However, this raises the question of what is meant by “specially produced or converted.” What characteristics or properties would identify this designation? Would a multiple use space shuttle specially made, among other things, to capture, repair, or remove satellites from orbit, for example, be included in the prohibited category? Terms such as “components of biosphere” and their “elimination” or “damage” are even more ambiguous. Would this include, for example, the damage to the ozone layer that results from each space launch, or to the destruction of outdated satellites or their removal from orbit to fall into the ocean for disposal? No less ambiguous are such phrases as “to eliminate, damage or disrupt normal function of objects in outer space.” The methods that can be applied to disrupt the functioning of systems in space vary greatly as a consequence of the fact that each system is unique. Spacecraft can be disabled directly using conventional (explosive), kinetic (contact/impact), nuclear, or laser weapons. Electronic interference can be generated using electronic countermeasure sources (electronic warfare devices), lasers, particle beams, or X-ray or UHF weapons.

Although no country intentionally creates electronic interference to disrupt the normal operation of the spacecraft of other nations during times of peace, it could hardly be expected that prohibitions on jamming such systems as GLONASS, NAVSTAR, and Galileo, which allow the adversary to use precision-guided weapons, would continue to be observed under wartime conditions, and it could hardly be expected under such conditions that attempts to disrupt the operation of support, dual-use, and commercial systems, or of ground control and communications (relay) centers, could be avoided.

However, it would be exceedingly difficult to coordinate a prohibition on creating such systems, since they can be justified at least by the argument that they deter other nations from creating or using them. This is especially true considering the fact that many of these weapons, including laser, kinetic, electromagnetic, and particle beam weapons, are as a rule multi-purpose devices, and their development, testing, deployment, and use are not restricted by any international treaties or agreements.

Prohibition of weapons systems that are based upon the directed transmission of energy, especially lasers, presents particular difficulty. These can be used for attacking aircraft, satellites, or ballistic missiles and their components in flight, as well as for detecting, scanning, and identifying objects on land, under water, or in outer space, and can

also be employed to aim other types of weapons systems. In the future, they could be applied in the rapid transmission of large amounts of data (i.e., for communications). Laser efficiency could theoretically be limited by correlating the emission power to the cross-sectional area of the beam (in steradian joules, integrating laser energy with the area of its reflective mirror), thereby differentiating systems intended as weapons from those performing support functions.

To coordinate such restrictions, however, would be exceedingly difficult considering the variety of laser types (pumping principles) and unequal properties of the environments through which the beams pass (space and atmosphere). For example, a laser having no destructive capability in a dense atmosphere may prove effective in disabling satellites over great distances in space, ballistic missile boosters at shorter range as they exit the atmosphere, or missile warheads at close range.

Lasers based in space might be more or less effective as anti-satellite weapons depending upon the range to target. However, considering that both the weapons platforms and their potential targets are in orbital motion, and that such orbits can be varied, it would be even more difficult to translate any limitation of their technical characteristics into a limitation of their combat capabilities. This is yet another area of distinction from the practice of limiting, say, nuclear weapons, where technical characteristics with certain allowances determine operational range, and prohibition of their deployment abroad could quite reliably differentiate strategic systems from intermediate-range and tactical weapons within the framework of different treaties (for example, weapons with ranges of over 5,500 kilometers were defined as ICBMs, missiles with ranges of between 1,000 and 5,500 kilometers were classed as intermediate-range, missiles ranges of between 500 and 1,000 kilometers were termed short-range tactical, ranges over 600 kilometers were SLBMs, ALCMs, and SLCMs, etc.)

To prohibit the development, testing, or use of space weapons or systems intended to interfere with the functionality of ground-based space command and communications facilities would be essentially impossible, since nearly all conventional or nuclear offensive weapons systems, electronic warfare capabilities, or other systems based upon new physical principles would be capable of performing this mission.

The greatest "overlap" challenge is posed by strategic ABM defense of any deployment type having an "inherent" (or "innate") anti-satellite capability at orbital altitudes of approximately up to 1,000 kilometers. Except for the early booster and final atmo-

spheric reentry stages, ABM targets pass through the same portions of space as the majority of spacecraft having orbital apogees on the order of 1,000 kilometers. Satellites at such orbits move slightly faster than the final stages and warheads of ballistic missiles (around eight kilometers per second compared to between five and seven kilometers per second, respectively), but otherwise present easier targets for interception.

It is true that there are different methods for enhancing the survivability of such space systems: organizational and technical measures to better defend spacecraft and ground-based command centers against various types of physical damage; redundancy of the most important types of spacecraft; placement into orbit of back-up “sleeper” satellites; preparation of delivery vehicles and satellites to rapidly replace disabled vehicles; and so on. However, such measures frequently involve considerable expenditures of money and time.

A major, non-pretentious condition for practical (as opposed to declarative or propagandistic) disarmament is verification of treaty compliance. Historically, it was only national technical means of verification (NTMV), primarily based upon satellite reconnaissance, that allowed the 1972 SALT I agreement to be concluded. At the same time, such technical means must not be taken as an absolute imperative. With the increase in mutual trust between the sides as they moved toward the implementation of ever more radical disarmament measures, NTMV began to be supplemented by transparency, confidence-building and cooperation measures, on-site inspections (including the removal of warhead fairings to allow warhead counting), continuous monitoring of facilities, and so on. Treaties such as the CFE (1990), the CWC (1992), and START I (1994) were unprecedented in this respect. Further, the same dialectical verification and disarmament progress for space weapons could also be quite possible. However, to expect an immediate breakthrough would be naive. It will be complicated by the newness and uniqueness of this subject of negotiation. In the majority of previous and existing disarmament treaties, the center of gravity for verification has been shifted to the deployment and operational phases of weapons systems (the ABM Treaty, START I, START II, the INF Treaty, the CFE, and the CWC). The 1967 Outer Space Treaty also relied upon this phase (with respect to WMD deployment), although it provided no means for verification. The verification measures in these disarmament treaties apply to a much lesser degree to the testing of such weapons

systems (the CFE does not cover the testing stage at all.) Exceptions are START I, under which missile testing is closely monitored (including a prohibition on encrypting telemetric data) and the CTBT, which is devoted entirely to testing. Not one of these treaties covers the development stage, i.e., up to the point of testing, other than the CWC and the BTWC, although the latter was never provided with a system of verification.

Space weapons, however, are already most difficult to prohibit or limit at the deployment stage, especially if such deployment is in space, as in the draft PPWT of 2008. To use NTMV to identify prohibited weapons-carrying satellites from among the 700 or so other spacecraft currently operating in different orbits would be exceedingly difficult. It would be even more difficult to prove that they are covered by the treaty without inspecting them in space or returning them to Earth (even if the treaty identifies the technical characteristics of prohibited systems, rather than merely defining their deployment environment and locations of potential targets for attack).

This also relates to the potential small-sized satellites being developed to inspect spacecraft at any orbit. Such inspections of the spacecraft in space or following their return to Earth would in many cases be technically impossible, dangerous, and most probably unacceptable for the nations, based upon concerns for the preservation of military or commercial secrecy.

The situation is also ambiguous for the ground-, air-, and sea-based space weapons that are most likely to be developed within the foreseeable future (despite their omission from the Russian-Chinese draft). For air-based systems, such as the U.S. F-15 short-range Altair attack missiles deployed in the 1980s or the Soviet anti-satellite system based on the MiG-31, prohibition of deployment would be extremely difficult to verify due to their dual-use aspect and the massive numbers of such aircraft in the military inventories of the two countries, as well as the small size of the interceptor missiles, which allows them to be kept at any Air Force storage facility. Of course, these ASAT are equipped with special guidance and control systems, but to prohibit these would "invade" the overall ground-based infrastructure of the space complex, which would not be a very viable option. A numerical limitation of systems of this type would be more achievable, but would require broad transparency, coordination of the functional

distinctions between the aircraft and missiles, compliance verification measures, separate locations of permitted ASAT deployment, and, possibly, agreement to allow on-site inspections of the other side's air bases on short notice.

Thus, a major distinction of space weapons, especially those based in orbit, from all other weapons types that have previously been the subject of disarmament treaties is that they would be exceedingly difficult (if not impossible) to limit or prohibit after they have been deployed in the respective branches of the armed forces in these nations. This is due both to difficulties with verification and the variability of their technical characteristics, potential missions, and applications. At the same time, the deployment particulars of space weapons relating to the locations of both their basing and their targets could permit substantial limits on their development by restricting full-scale testing.

Prospects For a Treaty to Prohibit Space Weapons

Negotiations to prohibit space weapons could become a practical goal within the context of renewal of the entire disarmament process and system, especially if the Obama administration should initiate a review of some or all of the aspects of U.S. military space policy. In that case, considering past experience and previous initiatives, it will become necessary to reconsider the entire approach to the subject, format and methods for legally regulating this sphere of military and strategic relations by treaty between the current and the potential space powers.

It would appear to be appropriate, at least initially, to abandon both the Soviet Union's position of the 1980s and the proposals recently advanced by China and Russia in Geneva. The subject of negotiations should be narrowed, and as opposed to 20 years ago, attempts to broadly prohibit every Earth-to-space, space-to-Earth, and space-to-space system (the technical characteristics and verification methods of which remain unclear) should be avoided.

It would be appropriate to recall that the practical basis for previous strategic arms agreements has not been the general peaceful intentions of the nations involved, but a balance between their asymmetric military interests. In the area of space, an obvious balance of the practical interests of the sides would be the prohibition or extreme limitation

of anti-satellite systems in exchange for abandoning the development of space-based ABM (kinetic interceptor) systems. The former would benefit the United States, the latter would suit China and Russia. By using such a treaty format, the technical overlap between ABM and anti-satellite systems, which has made it difficult to prohibit one without prohibiting the other, could expedite the introduction of measures intended to limit or prohibit them altogether.

Success in practical negotiations in this area will depend largely upon whether the subject of the agreements can be clearly defined and realistic measures of verification and transparency can be developed. It will be tremendously important to select an appropriate sequence of steps and format for the negotiating process. After all, the most advanced and technically “tangible” systems are currently the anti-satellite systems, while the space-based ABM systems relate to the more distant future (10 to 15 years), and the prospects for their development remain vague. This especially relates to space-to-Earth systems. To come to agreement on everything in a single package will not likely be possible, considering the differing definitions for the separate subjects of negotiation. In this regard, it would make sense for Moscow and Washington to take into consideration their experience from the 1970s and 1980s and the initiatives from independent experts of various countries.

A comprehensive prohibition on the deployment of all types of ABMs (in space, in the air, or on land) would be preferable, but difficult to achieve. As noted above, it would not be verifiable in space using any realistically available means, while on Earth, it appears that experimental missiles of this type are currently available only to China (which may be why the joint Russian-Chinese draft of 2008 covered only space-based systems). The United States and Russia have either mothballed or decommissioned their previous systems, while the new ones are only at the stage of development or are of dual use (such as the U.S. GBI or the Aegis Standard).

Rather than prohibiting deployment, this issue could be addressed indirectly through a preliminary agreement to prohibit testing of anti-satellite systems and space-based kinetic ABMs. This would imply the prohibition of testing that involved the actual destruction of dummy satellite targets or ballistic missiles and their components in flight, such as was conducted by the Soviet Union between the 1960s and the 1980s, the United States in the 1980s, and China in 2007. Such an agreement could rely on the national technical means of verifica-

tion of the parties, preferably in combination with measures of cooperation and a certain amount of transparency. For example, the current format for notification of all missile launches (including launches into space) should be reaffirmed and expanded to include all actions or experiments that cause damage to space objects.

The elimination of obsolete satellites that are in danger of falling to Earth should be carried out under the supervision of the other party (or parties), with adequate information provided to remove any suspicion that it might be a clandestine test of an anti-satellite system, such as the U.S. satellite intercept in 2008.

The initial treaty could be limited to a term of, say, 10 years with an option to renew, which would be less than the time expected to be required for the introduction of “technically tangible” space-based ABM systems. As for any such treaty, it should contain a provision allowing the right of withdrawal from the treaty in cases of threats to the “greatest interests” of any of the parties. Russia (and China, should it sign on) could release a unilateral declaration stating that deployment by the United States of a space-based ABM system or any space-to-Earth system would be considered just such an event. This would serve as an additional deterrent, since the United States has an interest in limiting anti-satellite weapons to the maximum degree, provided that it can be reliably verified.

The format of the agreement might initially include Russia, the United States, and, preferably, China, and it should provide for the possibility that other powers could join the treaty in the future. A joint commission should also be established to verify compliance with the treaty and resolve disputes.

Such a treaty would have the following advantages:

- It would prevent development and improvement of anti-satellite systems, which are the most advanced class of space weapons, independently of the physical principles or forms of deployment of such weapons;
- It would involve a relatively simple verification method that relies upon national technical means of verification with minimal transparency and cooperation measures;
- It would slow the development of the kinetic elements of space-based ABM systems;
- It would prevent experiments that could lead to the accumulation of “space junk” and threaten the satellites of all nations;

- It would include China (and subsequently other nations) at an early stage of the new strategic arms limitation process;
- It would slow the development of anti-satellite systems that could attack vital missile early warning, navigation, communication, and monitoring satellites from a “distant approach.”

At the same time, the proposed treaty is not without its faults, including some very substantial ones, in particular such as the following:

- It would not prevent ASAT from being tested or deployed indirectly through the testing and deployment of ABM systems of different basing types (aside from space);
- It would not prevent “space mines” from being clandestinely deployed during peacetime or prewar periods (primarily in geostationary orbit) without testing or the guaranteed ability to attack satellites;
- It would not prevent the clandestine development of low-intensity anti-satellite operations that would allow manned or unmanned spacecraft to approach, capture, and dispatch spacecraft from orbit that have either completed their service lives or are in need of repair;
- It would not prevent clandestine testing of energy beam weapons (laser or particle beam) or electronic warfare technology that could functionally disable satellites without destroying them;
- It would not prevent the development of space-to-Earth kinetic weapons, including those based upon partially orbiting missiles, multi-use spacecraft, or other technologies or operational ideas that are still hypothetical;
- It would not prevent the targeted development of anti-satellite weapons in asymmetric response to new systems or non-nuclear warfare capabilities, including the use of long-range PGW that rely on space systems for information support;
- It would not provide direct countermeasures to any hypothetical space-to-Earth systems that may appear.

While such problems must be admitted, it should nonetheless be emphasized that the advantages of the proposed version still appear to outweigh its shortcomings. Moreover, as a first practical step in preventing the weaponization of space, it would be relatively

more likely to be achieved, both from the standpoint of its mutual military and strategic acceptability to the parties and in the tangibility of its technical parameters and its verifiability.

The proposed treaty will necessarily be of a partial and selective nature both for military and political reasons and in light of objective technical and physical realities (in particular, the uniqueness of the space environment). This was also true, incidentally, for the 1972 SALT I and the 1979 SALT II arms limitation treaties. If not for these natural stages of disarmament, however, the parties would have never been able to achieve the unprecedented comprehensive reductions, limitations, and transparency measures of START I twenty years later, or reach agreement on the New START in Prague in 2010. If this first step to demilitarize space through the verifiable prohibition of all anti-satellite systems and space-based ABM testing is taken, however, limited though it may be, it could be followed by other, more sweeping and intrusive verification measures, as happened for strategic nuclear arms limitation.

The possibility for indirectly developing anti-satellite capabilities through related fields of military technology does not provide any assurance that these would function properly under actual wartime conditions, particularly if they involve not demonstrative actions, but a rapid and coordinated strike against the adversary's space-based satellite constellations as a whole to bring about a fundamental and irreplaceable degradation of that adversary's overall military capability. In exactly the same way, development of an ability to intercept ballistic missiles with space-based ABM systems would not grant any assurance that it would be capable of countering great numbers of missiles and warheads in flight unless the combat platforms were deployed and tested in orbit. Without full-scale testing, the nations responsible would never deploy such expensive weapons systems so vitally important for military planning. Besides, such future space-based ABM systems could be countered using other asymmetric means and measures.

With the change of U.S. administrations in 2008 and the deepening global financial and economic crisis, the prospects of **an expensive and complex strategic ABM system (in particular a space-based version) being built by the United States are dubious. This is especially true of space-to-Earth weapons.**

Finally, the main argument in favor of the proposed treaty is based upon the question of what kind of realistic alternative there could

be to preventing anti-satellite systems or space-based ABMs by prohibiting full-scale testing. It would seem that this alternative would not lie in previous Soviet proposals or in the Russian-Chinese draft of 2008, which should probably be seen more as a gesture of good will. In fact, another alternative would be the absence of any future legally binding treaties to limit the weaponization of space, and the gradual transformation of space into an arena of military rivalry and potential armed conflicts.

Over the long term, the growing threat of a space arms race and in particular of conflicts developing in space will inevitably lead to the “vertical” and “horizontal” proliferation of nuclear missiles and an irreversible crisis for the entire regime of nuclear disarmament and nonproliferation. Moreover, the space environment (where there are no national borders or natural cover) would present the greatest hazard should it become saturated by weapons, due to the potential for accidents, incidents, false alarms, and malfunctions in the systems of control.

Having entered the age of globalization, the world faces ever newer security problems that cannot be solved through unilateral efforts, not to mention military force. In order for it to meet these challenges, cooperation among its leading powers and all responsible nations is desperately needed, including in the use of space to combat the proliferation of WMDs, intercede against international terrorism, support multilateral peacekeeping operations, provide verification of the more radical steps toward disarmament, pursue effective measures to address climatic and environmental problems, and enhance security in the areas of energy and food supply.

All of this makes it imperative that international agreements to prevent the weaponization of space be developed without delay. A first step in this direction might involve the immediate adoption of a code of conduct for space-faring nations, under which they would voluntarily adhere to the general principles of the peaceful and cooperative use of space (the Council of the European Union proposed a draft of such a code at the end of 2008 under the name Code of Conduct for Outer Space Activities.) The next step must be a transition to the development of legally binding treaties (one possible version of which has been presented in the present paper), which would become a practical step toward a regime of space utilization that functions only in the exclusive interests of global security.

NOTES

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CHAPTER 24

GLOBAL PARTNERSHIP

Natalia Kalinina

During the Kananaskis Summit of the world's eight leading nations in 2002, a new program was approved entitled the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP), with a total financial commitment of 20 billion dollars over 10 years. This initiative became a great stimulus to reinforce international stability and security.

At that time, it was decided that the Global Partnership would initially focus on projects in Russia, which bears the primary responsibility for meeting its commitments in disposing of excess WMDs, and that its signatories would be ready to enter into negotiations with any other recipient countries, including the former republics of the Soviet Union, prepared to adopt the main principles of the GP. During that summit, agreement was reached to implement an eight-year cycle of G8 meetings, where the nations could report on the progress made and define plans for the future. The latest such summit was held in the summer of 2010 in Huntsville, Canada.

The GP represented an expanded version of the well-known U.S. Nunn-Lugar Program,¹ which since 1992 has encompassed a great number of collaborative efforts (transfer, storage, elimination, etc.) covering all classes of WMDs, in particular in the nuclear sphere. In 1999, these same two U.S. Senators proposed shifting such bilateral programs of assistance to a multilateral level, which was not immediately supported by the European countries² and was only implemented in the GP format in 2002.

The GP Program and its priority areas of cooperation as established in Kananaskis (destruction of chemical weapons, scrapping of decommissioned nuclear submarines, recycling of fissile materials, and the reemployment of former weapons scientists) have made some progress over past years, although the way in which plans have been implemented as actual projects continues to raise numerous

questions, while the number of priorities has gradually grown to include the physical security of nuclear materials.

In 2008, the countries of the G8 and the other GP participants agreed to expand the geographical area of cooperation and direct the GP to engage in efforts to combat the risk of proliferation of weapons and materials of mass destruction throughout the world; i.e., they agreed with the need to expand the GP beyond the borders of Russia and Ukraine by including new participants who support the principles and goals of the GP. There have been 23 participants in the Partnership since 2004, including the European Union. Nevertheless, in spite of appeals by the G8 for other nations to join the global initiative, no new donor nations have come forward over the past six years. It is possible that the situation may change due to the expanded areas for cooperation that continue to be discussed.

Current realities and the conclusion of the New START Treaty have made it appropriate to analyze certain results and prospects of the Global Partnership relating to nuclear security.

The Global Partnership in the Nuclear Sphere

The participants in the GP have attached the greatest priority in this area to providing security during the storage and recycling of nuclear warheads, radioactive materials, and strategic delivery vehicles; the provision of material protection, control, and accounting (MPC&A) for nuclear materials; the recycling and cessation of production of nuclear weapons materials; the removal of radioisotope thermoelectric generators (RTG) from operation and their recycling; and the improvement of systems of export control (EC) to monitor the movement of nuclear and other materials that could be used for the production and proliferation of WMDs.

The scrapping of Russian nuclear submarines is a highly complex process entailing a series of specific steps, including vessel decommissioning (weapons offload, crew reduction, layout berthing, etc.); offloading spent nuclear fuel and holding it in fleet storage for three years; subsequently transferring the spent nuclear fuel into storage and reprocessing it at the Mayak Production Facility; dismantling the missile compartment (disassembling the SLBM launchers) and deactivating, scrapping (cutting), and partitioning the nuclear submarine's reactor compartment (three-compartment reactor

blocks); removing its “clean” compartments; transferring the three-compartment reactor blocks to a temporary storage facility under radiation safety monitoring; physically protecting the facilities where solid and liquid radioactive waste formed during reprocessing of the spent nuclear fuel is stored; rehabilitating shore-based technical facilities, etc.

Of great importance is the provision of security for spent nuclear fuel and other radioactive waste. Experts estimate that it might take Russia 70 years to resolve the accumulated problems in its “peaceful atom” sphere.³ Although there are currently 18,500 tons of spent nuclear fuel stored in Russia, its existing storage facilities are not adequate to the task of reliably isolating the radioactive waste from the environment for the full period during which it presents a hazard. Significant modernization of the active facilities is needed, but it is proceeding very slowly.⁴ The point must be made that there are currently over 15,900 Russian organizations of different government agencies and companies with various forms of ownership that generate ionizing radiation, a fact which significantly increases their vulnerability to the threat of terrorist attack.

There are six main features that determine the status of these problems and their potential solutions:

1. *The security of nuclear warheads, radiological materials, and strategic delivery vehicles during storage and recycling.* This issue arose immediately following the breakup of the Soviet Union, once Russia had declared that it was the legal successor to all of the accumulated tactical and strategic nuclear weapons. The first, most urgent problem was to ensure the safe removal of nuclear munitions from Belarus, Kazakhstan, and Ukraine, for which purpose the United States rendered significant assistance by supplying over 4,500 armored casings, 150 super containers, kits to reequip 117 rail cars for transporting munitions and five special units for emergency response in case of accident, and over 26,000 containers to store fissile materials extracted from the elimination of nuclear warheads, as well as other equipment. The framework agreement in effect since 1992 has been the legal basis for cooperation in this sphere.⁵

Following the U.S. lead in addressing the problem of transporting nuclear munitions, Great Britain added to the effort by providing 250 super containers and 20 armored vehicles designed to transport nuclear weapons. Aside from the help of the United States and Great

Britain, France also provided super containers in the early 1990s, and Germany and Italy supplied emergency equipment for the 12th Chief Directorate of the Russian Ministry of Defense. Thanks to such international assistance, much was accomplished during the 1990s to improve physical security at the nuclear storage sites.

On the whole, by the time the Global Partnership was formed, the security of Russian Navy facilities had been guaranteed to approximately 80 percent and that of its strategic missile forces nuclear warheads to 20 percent.⁶ With the assistance of the United States, work to improve physical security systems at Russian nuclear facilities was planned for completion between 2008 and 2010. According to data for mid-2008, U.S. assistance helped to secure 85 percent of Russia's nuclear weapons storage facilities, including 50 naval facilities, 11 strategic missile sites, and 193 buildings. **Radiation monitoring equipment was installed at an additional 117 nuclear sites.**

Once the GP Program began, the reduction and limitation of strategic offensive weapons in Russia continued by using not only funds allocated under national defense contracts but also aid from abroad (predominantly the United States). Thus, by the end of 2005, 252 SLBMs of various types had been removed from naval ships and eliminated; 154 liquid-fuel ICBMs and 34 solid-fuel SS-24 ICBMs had been eliminated; and 96 silo and 28 rail mobile launchers for the SS-18 ICBM had been destroyed.⁷ Incineration of the solid-fuel SS-24 and SS-25 engines continued with the commissioning of a new SS-25 solid-fuel ICBM elimination center in Votkinsk capable of destroying up to 48 ICBMs annually and the construction of a storage complex with **storage units for 59 ICBM and solid-fuel rocket engines. The Russian Ministry of Defense has modernized its dismantlement facilities to meet START requirements for ground-based mobile launchers by being capable of eliminating 50 launchers each year. Strategic missile complexes of various basing types continue to be decommissioned, and the specialized infrastructure for the various nuclear sites is being eliminated.**

Over the first three years of the Intermediate-Range Nuclear Forces Treaty, Russia completely eliminated two classes of nuclear missile weapons: intermediate-range (between 1,000 and 5,500 km) and short-range (between 500 and 1,000 km). By the end of 2005, 1,864 missiles, 825 launchers, and 1,761 units of auxiliary equipment had been eliminated, and 74 missile bases and 31 auxiliary facilities had been closed and ceased to exist. On the whole, by 2008

the Russian nuclear weapons arsenal had been reduced to less than one fifth of the size of the USSR arsenal.

2. Physical protection, control, and accounting for nuclear materials. All of the GP participants, including Russia, attach particular importance to this subject.⁸

According to expert estimates, between 120 and 150 tons of weapons-grade plutonium and 1,000 to 1,350 tons of highly-enriched uranium (enriched to 90-percent U-235) have been produced in the Soviet Union/Russia.⁹ The United States believes that at the beginning of the 1990s Russia had 603 tons of HEU and weapons-grade plutonium (very attractive for theft), and that 252 buildings at 40 different enterprises were in need of modernization of their nuclear materials security systems.¹⁰ According to official sources, 61 Russian organizations had access to nuclear materials in 2000.¹¹ Most of these weapons-grade materials are located in the “closed cities” of the Rosatom State Atomic Energy Corporation, as well as in certain enterprises and research institutes near Moscow. The amount of nuclear material at such sites varies from a few kilograms to several dozen tons.¹²

The closest MPC&A cooperation has developed between Russia and the United States.¹³ By the time the GP was established, the U.S. Department of Energy had installed safeguards systems completely or nearly completely in 115 of the 252 buildings housing the 192 tons of weapons-grade nuclear materials. Work had been completed at 81 buildings containing 86 tons of nuclear materials, while another 31 buildings holding 106 tons of nuclear materials had been subjected to so-called “rapid upgrade.” Work had begun at sites holding an additional 130 tons of nuclear material. In 1999, the U.S. Department of Energy initiated its Material Conversion and Consolidation Program for Russia, under which Russia was to remove the nuclear materials from 50 buildings situated at five different companies by 2010 and convert 24 tons of HEU into LEU for storage. For various reasons, however, implementation of this program has stalled. Between 1993 and 2001, the United States spent a total of 797.3 million dollars on improvements to the Russian MPC&A Program. It allocated 293 million dollars to the program in 2002; 235 million dollars in 2003; 258.5 million dollars in 2004; and 294.7 million dollars in 2005. Since 2006, the amount spent has been gradually declining, **yet the U.S. allocations have increasingly focused more on similar programs in other states of the CIS.** By 2020, the U.S. Department of Energy will have spent an estimated 2.2 billion dollars on the MPC&A program. This

amount includes 832.1 million dollars to complete the installation of equipment before 2011, 711.8 million dollars allocated to maintain the functionality of the MPC&A systems by 2020, 241.3 million dollars for program management, and 387.2 million dollars for conversion and consolidation of the nuclear material.¹⁴

Most experts feel that the greatest achievement of cooperation with the United States (under the GP) has been the reopening of the reconstructed Mayak Production Association, still the only fissile material storage facility in the world, on December 17, 2003. This plant, designed to store 400 tons (25,000 containers) of uranium and plutonium for a period of no less than 100 years, underwent renovation between 1995 and 2003, financed primarily by the United States (estimates are that of the approximately 400 million dollars spent on the project, only 30 to 40 million dollars was allocated from the Russian budget, i.e., less than 10 percent.)

The cooperation between Russia and the European countries in providing for the security of nuclear materials has not been as broad. A telling example is the cooperation with the Euratom Safeguards Office,¹⁵ which began in 1993. The total amount of financing from then until the present time has comprised about 11 million euros. Aside from the United States, since the early 1990s assistance on MPC&A has been forthcoming from France, Germany, and a few other countries. In order to improve physical security for the nuclear materials, many of the GP partners have channeled support to the IAEA Action Plan to Guard Against Nuclear Terrorism, which has been in effect since 2002. Russia and 82 other nations are participating actively in this initiative. One of the more effective measures has been Russian efforts (supported by the IAEA) to have fresh HEU nuclear fuel from research reactors of Russian construction in third countries returned to Russia. Today, this Action Plan is operating in 14 countries. The fuel has been completely removed from Bulgaria, Latvia, Lithuania, and Romania and partially removed from Belarus, the Czech Republic, Germany, Hungary, Kazakhstan, Libya, Poland, and Serbia; spent HEU fuel has been removed from Belarus, Germany, Poland, Serbia, and Ukraine.¹⁶ In 2012, Russia plans to repatriate the fuel from Ukraine, Uzbekistan, and Vietnam.

3. *Recycling of weapons-grade nuclear materials.* Russia is not currently producing any nuclear material for weapons purposes. The production of HEU was halted in 1988, and by September 1992, 10 of its 13 weapons-grade plutonium reactors had stopped

production (five at Chelyabinsk-65 in Ozersk, five at the Tomsk-7 complex in Seversk, and four at the Krasnoyarsk-26 nuclear facility in Zheleznogorsk). Two others in Seversk were shut down in 2008. The United States and a number of other GP participants assisted in the shutdown of the reactors.

Russia cooperates with Canada, France, Germany, Japan, and the United States in recycling weapons-grade plutonium, although this process has not always had the expected results.

Most of the problems have related to the implementation of the Agreement with the United States of 2000,¹⁷ which stipulates that each party shall recycle (transform into a condition that prevents its use in nuclear weapons) no less than 34 tons of weapons-grade plutonium (two tons per year for 17 years) and refrain from reprocessing irradiated MOX (uranium-plutonium) fuel until the parties have disposed of the 34 tons of weapons-grade plutonium. The Agreement expired on July 23, 2003. The United States refused to renew it due to the unresolved matter of civil liability for nuclear damage.¹⁸ The other GP participants froze aid for the project as well (a joint allocation of funds had been expected from Belgium, France, Germany, Great Britain, Japan, Sweden, Switzerland, and other countries that would have totaled over 850 million dollars.) The question of civil liability for nuclear damage was partially resolved by a Protocol to the Agreement signed on September 15, 2006, which had become possible thanks to Russian ratification of the Vienna Convention on Civil Liability for Nuclear Damage.¹⁹ Russia ratified the Agreement on May 20, 2011, and another protocol to the Agreement (signed on April 13, 2010) was ratified on May 25, 2011.

The Megatons to Megawatts Program (the HEU Agreement), under which 500 tons of Russian highly-enriched uranium (enriched to 90 percent U-235) removed from nuclear weapons was to be reprocessed into low-enriched uranium (enriched to no more than 20 percent U-235), is being implemented with great difficulty.²⁰ The main impediment to its implementation relates to the matter of payment for the natural uranium component of the delivered LEU. Under the HEU Agreement, 231.5 tons of HEU, which corresponds to 9,261 dismantled nuclear warheads, had been blended down by December 31, 2004.²¹ By the end of 2007, this had increased to 320 tons of HEU (equivalent to 12,800 nuclear warheads).

4. The decommissioning and recycling of radioisotope thermoelectric generators (RTG). Radioisotope thermoelectric genera-

tors (RTG) represent a danger in that their “isotopic core” could be used to carry out acts of terrorism. This is the reason why immediately upon removal the RTGs and their main component (RIT-90 strontium-90 radioisotope thermoregulators) must be shipped in special containers to the Mayak Production Association (Mayak PA) for recycling, ensuring all security requirements.

The RTGs are spread territorially across four regions: on the Barents and White Sea coasts, along the Northern Sea Route (from Arkhangelsk to Provideniya Bay), on the coasts of the Russian Far East (from the Bering Strait to Vladivostok, including Sakhalin and the Kuril Islands), and on the islands and coasts of the Baltic Sea. Altogether over 1,000 RTGs were produced in the Soviet Union. Although some of these were recycled upon expiration of their service lives, the remainder is scattered throughout Russia and the former Soviet republics, with some of them standing abandoned in derelict condition. At present there are about 500 RTGs operating in Russia. About 300 RTGs were disposed of before 2009, and about 200 were placed into storage.

The United States first became involved in the problem of handling RTGs in 2003, i.e., after the GP had been formed. Between 2003 and 2008, with assistance from the United States, over 120 RTGs were dismantled and recycled, and two temporary storage facilities for RTGs were built, the first based upon the technical infrastructure in Sysoyev Bay (Vladivostok), and the second at a storage site in Vilyuchinsk on the Kamchatka Peninsula. At present, Russia is being supported in handling its RTGs by Canada, Denmark, France, Germany, Norway, and the United States. Other countries have been expressing interest as well.

5. Export control improvements. This sphere of cooperation is considered to be a GP priority, since it is one of the effective mechanisms for preventing the proliferation of WMDs and the materials to produce them. The question of export controls (EC) gained particular significance following the adoption of UN Resolution 1540 by the Security Council in 2004, which required all UN member countries to establish national EC systems and institute criminal and civil penalties for violations.²²

In Russia, the legal foundation for EC action has been established under federal law.²³ Lists of all mineral resources, materials, equipment, scientific and technical information, work, services, and the products of intellectual activity subject to export control

must be approved by presidential decree. There are currently six such lists, two of which relate directly to the sphere of nuclear security.²⁴

In working under the GP to improve its export control systems, Russia has engaged in international cooperation efforts primarily with the United States and the European Union. Under the U.S. Department of Energy, approximately 68.5 million dollars has been spent to date for export control purposes in Russia and Ukraine combined, along with another 11.3 million dollars through the U.S. Department of State. In the sphere of export controls, the United States has devoted most of its attention to working with customs authorities, equipping them with modern export radiation monitoring devices. Recently, at U.S. expense, 60 Russian border crossing checkpoints were outfitted with modern radiation monitoring equipment, including customs stations at roadway, sea, river, railroad, and aviation crossings. Cooperation with the European Union for export control improvement is being carried out through a TACIS project on the Export Control of Dual-Use Goods. This project began in 2006 and lasted for three years (at a cost of about three million euros). **The role of project coordinator** for the European Union was performed by the Federal Union of Economic and Export Control (FRG); the Federal Service for Technical and Export Control was appointed as coordinating partner for Russia. The main goal of the project was to analyze the current export control regulations in Russia and develop recommendations for improvement. The preliminary results were published in 2007.²⁵ Financial resources have been allocated to fund the project for the period from 2007 till 2013.

6. The recycling of nuclear submarines. Between December 1958 (when the Soviet Union commissioned its first nuclear submarine) and the present, the Soviet Union/Russia built the largest nuclear fleet in the world. A total of approximately 250 nuclear submarines has been built, including 91 strategic missile-launching submarines,²⁶ as well as several nuclear cruisers, icebreakers, a communications support ship, and their at-sea support components. Before the mid-1980s, there were no facilities in the Soviet Union that could recycle nuclear submarines in complete safety, and there were problems with reprocessing radioactive waste and handling spent nuclear fuel safely. By the beginning of the 1990s, the nuclear submarines built in the 1960s and 1970s had begun to reach the end of their service lives. However, neither the Soviet Union nor, later, Russia, had

the technological or **financial capability to recycle them**. The economic crises in Russia and the massive decommissioning of nuclear submarines from the fleet served to exacerbate the situation.

Since many of these boats were decommissioned 15 to 20 years ago, their nuclear fuel, having lost its self-protective ability, began to represent a danger from a nuclear materials proliferation standpoint. An even more dangerous situation regarding environmental and physical protection **arose in connection with the nuclear fuel unloaded from nuclear submarines and placed into storage on shore**. An enormous amount of radioactive waste had been accumulating gradually from normal submarine operations and recycling. Experts estimated that it would require up to 4.5 billion dollars to address the complex of problems associated with recycling.²⁷

A total of 198 nuclear submarines were awaiting recycling. Before the inception of the GP Program, i.e., by 2002, 71 boats had been recycled in Russia, including 17 strategic submarines that were recycled using U.S. financing. Also, before July 2002, Russia had solicited **international aid to create and modernize the infrastructure necessary for nuclear submarine recycling, including creation of the facilities and equipment at the Zvezda and Zvyozdochka shipyards to reprocess and store low-level radioactive waste; construction of two shore facilities for the removal of spent nuclear fuel from nuclear submarines awaiting recycling; construction of areas at four enterprises for the storage of spent nuclear fuel in containers; maintenance work on three sea-going technical facilities for taking on spent nuclear fuel and their offload equipment; fabrication of containers for the storage and transport of spent nuclear fuel; fabrication of enough special railway cars to make up one specialized train to transport spent nuclear fuel by rail; modernization of the liquid radioactive waste reprocessing equipment at the Atomflot Federal State Enterprise; construction of a road and a water supply conduit at Andreyev Inlet; repair of the liquid radioactive waste storage facility at the Zvyozdochka shipyard; and other projects**.

Notable progress was made in this area of cooperation between 2002 and 2009. Australia, Canada, the European Union, France, Germany, Great Britain, Italy, Japan, New Zealand, Norway, South Korea, Sweden, and the United States are now participating in the program to recycle nuclear submarines. As a result, as of the beginning of 2010 there were only eight submarines awaiting recycling.

In addition to the dismantlement of nuclear submarines, significant assistance has also been forthcoming in the area of handling spent nuclear fuel and radioactive waste, transporting the submarines to the recycling yard, and creating the infrastructure needed to carry out the work. The previous technical shore facilities are being rehabilitated.

Thus, a new long-term storage facility in Sayda Inlet intended to receive dismantled reactor blocks and other nuclear components from nuclear submarines **has been put into partial operation. The second stage of the Sayda project, consisting of the construction of a new facility for the reprocessing and storage of radioactive waste, is already underway** (with financial assistance from Germany).

Construction of a solid and liquid radioactive waste handling and temporary conditioned waste storage facility is underway in the Andreyev Inlet. The waste handling facility is being created so that the waste can subsequently be sent to the Atomflot plant in Murmansk. This project is being supported financially by Great Britain, Italy, Norway, and Sweden.

Rehabilitation of the former Navy base in Gremikha continues, with assistance from France. Work was begun in 2008 to prepare for the offload of spent nuclear waste and its transport to the Atomflot plant in Murmansk. **France has also been helping to complete the modernization of the Zvyozdochka radioactive waste incinerator.**

Italy has been financing plans to offload fuel from a former nuclear cruiser for recycling, and to build a multi-purpose sea-going ship for the transport of spent nuclear fuel and conditioned waste.

Construction of a long-term reactor block storage facility at Razboynik Bay is now under way, following the signing of an agreement in **May 2009 under which Japan is to supply the equipment** for this site.

Work aimed at improving the physical protection and condition of the environment, including the provision of new equipment for the Nerpa and Zvyozdochka shipyards, is being financed by Canada and Italy.

Table 6
Cooperation with Russia under the GP

No.	Country	Total Commitment	Nuclear Security Commitments*
1	Canada	1 billion dollars (CAD)	238.2 million dollars (CAD)
2	France	750 million euros	55.1 million euros
3	Germany	1.5 billion euros	386.8 million euros
4	European Union	1 billion dollars	27.8 million euros
5	Italy	1 billion euros	25.4 million euros
6	Japan	200 million dollars	around 35.0 million dollars
7	Great Britain	750 million dollars	143.5 million pounds
8	United States	10 billion dollars	3.820 billion dollars
9	Russia	2 billion dollars	473.0 million dollars
10-23	Contributing GP partners: Australia, (the Czech Republic)**, Denmark, Finland, (Ireland), the Netherlands, New Zealand, Norway, (Poland), South Korea, Sweden, (Switzerland)	around 200 million dollars	around 130.0 million euros
<i>Total</i>			4.458 billion dollars 495.1 million euros 238.2 million dollars (CAD) 143.5 million pounds
<i>In U.S. Dollar Terms</i>			5.3647 billion dollars

Notes: * As of mid-2009.

** Countries not contributing to the Russian nuclear security improvements program are shown in parentheses.

Construction of a new spent nuclear fuel storage facility has been completed at the Atomflot plant in Murmansk, funded by Great Britain.

In total, GP participants have pledged the equivalent of 2.065 billion dollars for the complete recycling of nuclear submarines. Realistically, the amount received is close to one billion dollars.

Financial Summary. Specific figures on the scope of assistance to Russia for the areas of cooperation reviewed herein (the nuclear sphere, nuclear submarine recycling, export controls, and others) as of mid-2009 are presented in Table 6 above.²⁸

What Comes Next?

On the whole, the data presented above reveal many lines of cooperation and reflect the political and military interests of the sponsoring countries and their desire to enhance their own national security by promoting the **disarmament process in Russia and reducing the military and environmental threats emerging from that country.**

It cannot be said unequivocally that the “Global Partnership” has emerged as initially envisioned in Kananaskis in 2002 or as earlier proposed by the United States in the Nunn-Lugar Plus Program.

Cooperation continues to develop in recycling nuclear submarines. There has been some successes reached in the terms of nuclear and radiological security (for example, for radioisotope thermoelectric generators). This cooperation has also proven of benefit to Russia in terms of export controls, which are not so burdensome financially but are important from the standpoint of formulating all-European approaches to the verification of WMD nonproliferation.

Although the GP program has been in existence for nearly eight years, by no means all of its mechanisms for cooperation have been worked out. The implementation of agreements continues to be plagued by a large number of complex problems that are difficult, time-consuming, and **not always effectively addressed (in particular such issues as provisions in the law, the translation of political agreements into international legal frameworks, tax questions, financing and accounting methods, etc.)**

One integral criterion reflecting the effectiveness of the “Global Partnership” might be found in the relationship between the sizes of the commitments announced by these nations at a political level

(which totals 20 billion dollars for all of the countries together) and the amounts actually allocated. **Thus, the nuclear disarmament, physical protection of nuclear and radiological materials, and radiation security projects have received allocations from all of the countries totaling over five billion dollars, including the Russian share of the nuclear submarine recycling program, which reflects only 27 percent of the total commitments in these three areas by the same nations.** Scarcely a single nation has kept all of the commitments that the G8 leaders had previously made. Yet although the GP Program was set to terminate in a two years period, the G8 leaders agreed in 2011 to extend it beyond 2012.

Something of a viability test for cooperation efforts under the GP Program was provided by the **G8 Summit in Canada in the summer of 2010**, which reviewed such matters as not only increasing the numbers of its **participants, both donors (Brazil, China, India, etc.)** and recipients (Albania, Libya, Syria, and other countries of the Middle and Near East) but also extending the GP Program by another 10 years, i.e., to 2020 to 2022.

There is some justification for such a decision: the time has come to breathe new ideas into the Global Partnership; otherwise interest in it might be lost completely. There is a risk that the GP ideology as such could degrade, with all of the attendant consequences. Moreover, **the continuing global financial crisis could exert a negative and potentially even ruinous influence on the dynamics of the subsequent development of the GP.**

At the same time, considering its present economic, technological, and intellectual abilities, Russia could and, it would seem, should alter its role and position in the Global Partnership, changing from a recipient to a donor, particularly now that a decision is imminent to expand the number of members.

Russia should provide its data to the GP Program on the amount of financial assistance (or co-financing) it provides to all state branches engaged in disarmament and WMD nonproliferation.²⁹ This would refer to **Russia's own funding (primarily out of the federal budget)** of such areas as: nuclear and radioactive security (unceasing efforts to improve the physical protection of nuclear facilities and nuclear and radiological materials); dismantlement of nuclear warheads; reductions in numbers of delivery vehicles for strategic offensive weapons; **shutdowns of nuclear reactors; the multilateral program for recycling plutonium; improved security at nu-**

clear power plants and nuclear fuel storage facilities; construction of shore facilities for the long-term storage of nuclear submarine reactors; **isolation and long-term storage of nuclear waste from submarines** and biological facilities; **improvement of the system of export and border controls**; etc.

By presenting data on the **financing of the full range of work on disarmament and WMD nonproliferation initiatives** under the Global Partnership, Russia will immediately be elevated in standing within the organization, and the concerns that some nations have raised about the condition of Russian nuclear and other facilities will be resolved.

NOTES

- 1 The program bears the names of Senators Sam Nunn and Richard Lugar, who developed the Soviet Nuclear Threat Reduction Act of 1991. Originally envisioned as separate agreements with Russia, Belarus, Ukraine, and Kazakhstan, four agreements were combined into what became known as the Nunn-Lugar Program, intended to assist former Soviet republics with dismantling, controlling, and protecting their WMDs. Russia signed the international Agreement on June 17, 1992; Belarus on October 22, 1992; Kazakhstan on December 12, 1993; and Ukraine on October 25, 1993. By 1993, the program was superseded by the Cooperative Threat Reduction Program, which was first included in the U.S. budget in 1994. In the years that followed, Russia concluded similar agreements with several leading countries in Europe and with Japan.
- 2 For their program, which was first tentatively named Nunn-Lugar Plus, the United States was prepared to allocate 10 billion dollars over 10 years. The initiative was not initially well received by the G8, as there was no serious political reason at the time for **moving from bilateral to multilateral cooperation**. A reason appeared on September 11, 2001, when the international community was **faced with the global threat of terrorism**. The GP officially declared its goal as preventing the acquisition or development of nuclear, chemical, radiological, or biological weapons, missiles, and related materials, equipment, or technology by terrorists or those who would harbor them.
- 3 A State Duma round table devoted to discussion of the Federal Targeted Program on Nuclear and Radiation Safety concluded that it could take Russia 50 to 70 years to resolve its peaceful atom problems, including the disposition of its radioactive waste (RW) and spent nuclear fuel (SF). *RIA Novosti*, October 16, 2008.
- 4 Russia's State Atomic Corporation Rosatom plans to build its Nizhnekansky Rock Massif underground radioactive waste storage no earlier than 2035.

Rosatom plans to set up a scientific laboratory to study the proposed location, with results expected no earlier than 2025.

- 5 “The Agreement between the United States of America and the Russian Federation Concerning the Safe and Secure Transportation, Storage and Destruction of Weapons and the Prevention of Weapons Proliferation of June 17, 1992,” was amended and extended by the Protocol of June 15 and 16, 1991, amended again by the Agreement of January 13 and February 3, 2005, and then extended by the Protocol of June 17, 2006 (Government of the Russian Federation, *Resolution No. 364 of June 10, 2006*). It was ultimately ratified by Federal Law No. 128-FZ of July 22, 2008.
- 6 V.A. Orlov, *Nuclear Nonproliferation*, vol. 1 (Moscow: PIR Center, 2002) P. 52.
- 7 These data are based upon the white paper “The Russian Federation and Nonproliferation of Weapons of Mass Destruction and Delivery Systems: Threats, Assessments, Problems and Solutions” (prepared by the Russian Ministry of Foreign Affairs for the 2006 G8 Summit and distributed to Partnership members).
- 8 Government of the Russian Federation, *Resolution No. 352 of May 6, 2008*, “On Ratifying the Provisions on the System of State Registration and Control of Nuclear Materials.”
- 9 Orlov, *Nuclear Nonproliferation*, P. 60.
- 10 E.P. Maslin, “Securing the Nuclear Arsenals of the Russian Federation,” *Yader. kontrol*, no. 4 (Winter 2004): P. 23.
- 11 E.Yu. Fyodorov, “Cooperation for Global Security,” *Nauch. Zap.* (PIR Center) no. 19 (2002): P. 30.
- 12 A more detailed description of the weapons-grade nuclear material stockpiles available to Russia and the other official and unofficial members of the “nuclear club” may be found in: *Nuclear Weapons After the Cold War*, ed. A. Arbatov and V. Dvorkin, Carnegie Moscow Center (Moscow: ROSSPEN, 2006).
- 13 This cooperation came as part of the “Agreement between the Government of the United States of America and the Government of the Russian Federation Regarding Cooperation in the Area of Nuclear Material Physical Protection, Control and Accounting of October 2, 1999.”
- 14 V.A. Orlov, R.M. Timerbaev, and A.V. Khlopkov, *Nuclear Nonproliferation in U.S. – Russian Relations: Challenges, Opportunities* (Moscow: PIR Center, 2001), P. 73.
- 15 The European Atomic Energy Community (EURATOM) is an integrated group of 12 EU member states. It was established in 1958 to help

- the member states jointly oversee their raw nuclear material stockpiles and nuclear energy industries. The agency is headquartered in Brussels.
- 16 See: “Memorandum of the Russian Federation on Physical Nuclear Security of Apr. 13, 2010.” (This and other material from the Washington Nuclear Security Summit may be found at: www.kremlin.ru.)
- 17 “The Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation of Sept. 1, 2000.”
- 18 The Agreement (Article IX, Paragraphs 1 and 2) states that the Government of the United States of America and American personnel shall not be liable for any material losses and physical damage incurred in actions taken in compliance with the Agreement, except for cases of premeditated damage. As a condition for extending the Agreement, the Americans proposed deleting the stipulation concerning premeditated damage, i.e., providing total release from liability for damage, regardless of premeditation. This approach proved to be unacceptable to Russia.
- 19 Federal Law of the Russian Federation No. 23-FZ of March 21, 2005, “On Ratification of the Vienna Convention on Civil Liability for Nuclear Damage,” was signed on behalf of the Russian Federation in Vienna on May 8, 1996.
- 20 “The Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons of Feb. 18, 1993.”
- 21 *Guidebook. Global Partnership Against the Spread of Weapons of Mass Destruction*, Ed. V.A. Orlov. (Moscow: Prava cheloveka, 2005), P. 65.
- 22 There are no legally binding international export control agreements, and this area is covered only by a group of multilateral and informal regimes: the Zangger Committee, the Nuclear Suppliers Group (NSG), The Missile and Missile Technology Export Control Regime, the Wassenaar Agreement (WA), and the Australia Group (AG). Russia is a member of all these regimes except for the Australia Group. More details about national implementation of UN Resolution 1540 may be obtained from the 1540 Committee at <http://disarmament2.un.org/Committee1540>.
- 23 Federal Law No. 183-FZ of July 18, 1999, “On Export Controls,” (amended on December 30, 2001, by Federal Law No. 196-FZ, and on June 29, 2004, by Federal Law No. 58-FZ).
- 24 *Decree of the President of the Russian Federation No. 36 of Jan. 14, 2003*, “On Approval of the List of Dual-Use Equipment and Materials

- and Related Technologies Used for Nuclear Purposes Subject to Export Controls,” (amended by *Decree No. 1114 of Oct. 9, 2006*), and *Decree of the President of the Russian Federation No. 202 of Feb. 14, 1996*, “On Approval of the List of Nuclear Materials, Equipment, Special Non-Nuclear Materials, and Related Technologies, Falling under Export Control,” (amended by: *Decrees of the President of the Russian Federation No. 468 of May 12, 1997*; *No. 141 of Feb. 4, 2004*; and *No. 1318 of Nov. 14, 2005*).
- 25 Vol. 1 *Legal Assessment. Comparative Analysis of the Regulatory Frameworks of the European Union and the Russian Federation* (Moscow: 2007); Vol. 2 *Recommendations. Primary Results of the Comparison of the Regulatory Frameworks of the European Union and the Russian Federation* (Moscow: 2007). For further details about the project, please see: www.excon.eu-rf.ru.
- 26 “Nuclear Submarine Dismantlement: No one has breached the finish line,” *Yader. kontrol*, no. 4 (Winter 2004): P. 11.
- 27 *Ibid.*, P. 13.
- 28 These data cite the *Annual Global Partnership Working Group Report*, which was presented at the 2009 Summit. The table only includes lines of cooperation, projects, and financial commitments made directly in Russia. For more details about various Partnership projects see: *Guidebook. Global Partnership Against the Spread of Weapons of Mass Destruction*, Ed. V.A. Orlov, P. 183; *Global Partnership: Results and Outlook*, Ed. A.A. Pikayev (Institute of World Economy and International Relations [IMEMO] of the Russia Academy of Sciences [RAS], 2009); as well as G8 Summit material posted on the official website of the Russian Ministry of Foreign Affairs.
- 29 For reference: since 2004, Russia’s annual Global Partnership reports, which are supposed to provide the details of G8 commitments to Russia and the progress of these projects, have only included the financial details of its chemical weapons destruction and nuclear submarine decommissioning projects.

CONCLUSION

Alexei Arbatov

The collective study presented above addresses the multifaceted and extremely complex problem of nuclear weapons in the world today and for the foreseeable future. After a period of stagnation and decay that lasted over ten years, in 2009 and 2010 positive changes began to occur in this sphere of global politics. In order to build upon the success that has been achieved thus far, the governments of leading nations, the world expert community, and the nuclear disarmament movements will need to work step by step to overcome the enormous political, military, strategic, technical, and economic difficulties ahead.

The research conducted in preparing the book has permitted a number of new conclusions to be drawn and practical proposals to be formulated on the subject:

One. One great paradox of our time lies in the fact that nuclear deterrence remains effective against the least probable and most farfetched of threats, including mutual attacks by the great powers or their alliances using nuclear weapons or their main general purpose forces. However, nuclear deterrence is futile against new, quite realistic threats: the spread of nuclear weapons, international terrorism, ethnic and religious conflicts, increasing drug trafficking, trans-border crime and piracy, illegal immigration, etc.

Nuclear deterrence must be deeply transformed as a basis for relations between the great powers, primarily Russia and the United States, in order to remove the serious barriers that impede cooperation on a more effective level in combating the new security threats of the 21st century.

The most favorable conditions for strategic stability would be established through integration of missile early warning systems by the two sides, followed later by joint development and deployment of BMD systems in Russia, the United States, their allied countries,

and, subsequently, China. If that were to occur, relations between them (based upon the role of nuclear deterrence in the security of the great powers and the world) would be radically transformed.

In the same vein, the two nuclear superpowers should continue to pursue further reductions in their strategic nuclear offensive weapons, with a diminished doctrinal emphasis on nuclear deterrence; Russia and the United States should abandon plans for launching missiles based upon information from early warning systems; and the other nuclear powers should be encouraged to join the process of reducing the numbers of nuclear weapons and to implement confidence-building and transparency measures.

Agreed-upon measures by the great powers and all responsible nations to reinforce the Nuclear Non-Proliferation Treaty and its nuclear weapon and missile technology control regimes, as well as to improve safety and security in the storage and use of nuclear materials and technology, have become one of the most important means for enhancing strategic stability at the current stage.

Two. Today, the development and deployment of nuclear weapons have been proceeding at an immeasurably lower level and slower pace than during the Cold War era. Nevertheless, the doctrines and strategic concepts espoused by the nuclear powers continue to presuppose a readiness to use nuclear weapons in response to an attack against them or their allies using nuclear weapons or other types of WMDs (in the latter case China and the United States are exceptions). Moreover, France, Great Britain, Russia, and the United States provide for a first-strike capability against other nuclear powers, while Pakistan and Russia (and mostly likely Israel) would be prepared to initiate a first use of nuclear weapons if they faced a threat of catastrophic defeat in a war in which the adversary had used only conventional armed forces and weaponry.

The preparedness of the powers to use nuclear weapons first assigns them the role not only as instruments of deterrence but also as the means for conducting war and winning it, however that might be defined.

In 2010, the nuclear doctrines of Russia and the United States were adjusted; however, this appears mostly to have affected the declarative tone of the documents, rather than any real reorientation of strategy or nuclear weapons development programs toward a progressive reduction of the role of nuclear weapons in national and international security.

Three. The development of nuclear power will be an integral and irreplaceable component in supplying the growing energy requirements of the world for at least the next 30 to 50 years. Nevertheless, it is not envisioned that nuclear energy would ever replace hydrocarbons completely, merely that it would play a larger role.

In turn, the likelihood that nuclear energy could be used to resolve these problems will depend upon whether a number of important conditions can be met. Of these, one of the more essential is the need to enhance the emergency foolproofness and environmental safety of the “peaceful atom” and exclude the possibility of its use for military purposes, i.e., the proliferation of nuclear weapons. A future expansion of nuclear power in the world could give rise to greater availability of the technology and materials necessary to create nuclear arms.

The current nuclear weapons nonproliferation regime and nuclear energy safety standards would be inadequate for averting such consequences. The statute, mechanisms, and institutes of the Nuclear Non-Proliferation Treaty need to be reinforced through urgent, radical large-scale measures aimed at establishing acceptable levels for the safety of nuclear power today and in the future.

In recent years, the nuclear programs of Iran and North Korea have posed the greatest challenge to the nuclear weapons nonproliferation regime and the world community’s ability to maintain and reinforce it.

In Iran, the goal in developing nuclear technologies has been to acquire the scientific, technological, and material resources that could be used for creating nuclear weapons if the corresponding political decision is made. It is possible that the very act of acquiring sensitive nuclear fuel cycle technology is seen in Iran as a deterrent against the use of force against the country and as an attribute of national prestige and dominance in the Middle East.

Obviously, it would be ineffective to tighten sanctions further in their current form, while a military approach to resolving the issue would be extremely undesirable. Still, Iran must not be allowed to use the negotiations as a cover to advance its program in defiance of UN Security Council resolutions. Rather than continuing along the present course, where the Security Council issues its maximum demands and backs them up with weak sanctions, the demands should be moderate and realistic (such as a halt to expansion of the uranium enrichment capabilities in Iran, adoption of the 1997

Additional Protocol, and shipment of all LEU abroad to be converted into fuel) and be backed up by a preparedness to impose the full measure of strict sanctions under Articles 41 and 42 of the United Nations Charter should Iran fail to comply.

It could hardly be expected that North Korea would ever completely abandon its national nuclear programs over the near term. The country will likely try to maintain its limited nuclear capability. Under present conditions, it would be more realistic to work on returning Pyongyang not to the NPT but to the IAEA, since the latter's Statute provides for cooperation with nuclear nations. One of the first stage goals would be to freeze the North Korean nuclear capability at the current level, to restore international controls over its nuclear activities, and to cut off the movement of nuclear weapons, technology, fissile materials, and nuclear scientists beyond the borders of the republic.

In terms of the potential it represents for the use or proliferation of nuclear weapons, another source of risk is South Asia. Although the nonproliferation regime is indeed threatened by the nuclear weapons and military nuclear programs of India and Pakistan, the threat is not as great as is sometimes suggested in the media. Clearly, the greatest amount of effort should go toward preventing a conflict between India and Pakistan, and, in particular, excluding the possibility that nuclear weapons would be used.

India and Pakistan must be persuaded to include the principle of no first use of nuclear weapons in their national nuclear doctrines (with mandatory compliance). Another way to lower the risk of a nuclear conflict would be to sign an agreement not to base nuclear weapons in Kashmir. The same objectives, but on a broader scale, could be achieved through an agreement to maintain the two nuclear missile forces at a diminished level of operational readiness (thereby formalizing established practice). Such a provision, which would in effect tangibly embody a no-first-use commitment, could be verified using the U.S.'s and Russia's national technical means, and/or by permanent UN observers with access to the nuclear bases of India and Pakistan.

The danger of nuclear proliferation is compounded by the proliferation of missiles, which are the most effective delivery vehicles for nuclear weapons. However, if the missiles themselves, even those with non-nuclear warheads, are equipped with modern navigation systems, they become an ever more threatening means to attack nuclear power plants and other vulnerable targets. The prolifera-

tion of missiles and nuclear weapons has diminished the willingness of the great powers to pursue any further nuclear disarmament and prompted them to withdraw from existing treaties (ABM or INF).

The current system of limits on the proliferation of missiles and related technology does not allow such developments to be effectively countered. In order to address this problem, the effectiveness of the missile nonproliferation regime urgently needs to be improved, beginning by elevating the status of the Missile Technology Control Regime (MTCR) and the International Code of Conduct Against Ballistic Missile Proliferation (ICOC). Simultaneously, looking to the long term, it would be expedient to prepare a draft treaty that would integrate the MTCR, ICOC, and the Global Control System (GCS). Such a treaty would be modeled after the NPT and would serve as the basis for a new global and legally binding missile nonproliferation regime.

The chance that weapons of mass destruction, especially nuclear weapons, could be acquired by terrorists poses one of the most urgent threats to international security. Overcoming this threat will require closer cooperation between the secret services, special forces, law enforcement agencies, and the armed forces of Russia, the United States, and other states. Countries will also need to improve their national legislation to enhance the security of their nuclear materials and facilities. In accordance with the results of the Washington Nuclear Security Summit of April 2010, the standards adopted by the leading powers for physical security, protection, accounting, and control of the nuclear materials and facilities should be accepted by all countries conducting such activities. To these ends, they should be provided with financial and technical assistance, and the Nuclear Suppliers Group should resolve to make all future contracts on peaceful nuclear cooperation subject to the adoption and implementation of these standards by the states involved.

Four. Until it expired on December 2009, the START I Treaty between the Soviet Union/Russia and the United States had been unprecedented in its historical role. It had provided strategic stability under the exceedingly complex conditions that followed the end of the Cold War, ensured the continuity of full-format cooperation between the two nations in the sphere of nuclear weapons reduction, and allowed Russia to retain strategic parity with the United States at a critical time for its strategic nuclear forces. START I became the international legal foundation for the process of nuclear disarm-

mament, was used to full measure during the preparation of the New START, and will remain relevant in the future.

The prolonged break in strategic dialogue between Russia and the United States ended with the negotiation and signature of the New Strategic Arms Reduction Treaty between the two nuclear superpowers in Prague in April 2010. The New START limits mainly the numbers of warheads deployed on delivery vehicles, the numbers of deployed delivery vehicles, and the total number of deployed and non-deployed ICBM and SLBM launchers and heavy bombers. There are no restrictions on the structure or makeup of the nuclear triad, while the rules for counting strategic weapons, inspection systems, and notifications have been simplified.

Compared to the actual levels of SNFs, the limits set on warheads under the New START primarily reflect changes to the procedure for counting warheads on strategic delivery vehicles, thereby “legalizing” the existing and forecast numbers of strategic weapons. Nevertheless, this number of nuclear warheads is only a fifth of the number at the end of the Cold War, and a third of the limits under START I.

To resolve existing contradictions over BMD and other matters over coming decades appears no less important than to continue reductions of the SNFs. The Obama administration’s decision in 2009 to cancel the deployment of the strategic BMD system in the Czech Republic and Poland has opened the door to compromise.

However, the approach to cooperation in the BMD area to which the leaders of Russia and the United States both have agreed has not been pursued actively enough, and has thus far amounted to little more than joint assessment of probable missile threats. At the same time, however, there is a significant potential for real cooperation between the two powers, above all in the sphere of information system integration. The proposed Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches (creation of which was approved 12 years ago) should be reactivated without delay, and the theater missile defense computer training exercises with the participation of Russia, the United States, and NATO should be resumed and eventually expanded to military test ranges and beyond the theater of operations format. It would then be possible to begin the joint development and deployment of a theater missile defense system, followed by a global strategic missile defense system that would encompass the allies of the two powers, China, and other responsible states.

In the context of continuing reductions and limitations in nuclear weapons, it will become important that this process be applied to non-strategic systems as well. Russia has viewed tactical nuclear weapons as being primarily a tool to neutralize NATO's supremacy in general purpose forces, particularly in light of the Alliance's eastward expansion.

Assuming that a mutually acceptable solution can be found for this problem (primarily by restoring and enhancing the CFE Treaty), agreements for tactical nuclear weapons would be possible. It will be impossible, however, to combine the reduction and elimination of tactical nuclear weapons with cuts in SNFs, since tactical nuclear weapons are delivered with dual-use delivery vehicles (aircraft, short-range missiles, ship and submarine weapons systems, and artillery). In essence, the limitation, reduction, and elimination of tactical nuclear weapons involves the dismantling and recycling of the nuclear warheads, which in peacetime are stored at navy or air force bases or in centralized storage facilities. The process of controlled disarmament has not yet progressed to that level.

For this reason, with respect to tactical nuclear weapons it would be possible to agree to the initial step of removing all tactical nuclear weapons from forward bases to central storage facilities located deep within the borders of the country (i.e., essentially placed in reserve). In this context, the United States could remove its air bombs from five European nations, and Russia could in turn transfer its tactical nuclear weapons from its air force and naval bases into centralized storage. At the same time, reciprocity would require not only that the United States return its tactical nuclear weapons to U.S. soil, but also that it prohibit deploying them at air or naval bases, or placing them anywhere other than in centralized storage, where they can be inspected. It would be simpler to verify the removal of tactical nuclear weapons from forward bases, since the storage sites (the locations and characteristics of which are well known) would simply be empty. However, while practically feasible, such an agreement could prove to be a much greater problem and require greater large-scale measures for the United States than for Russia.

Another problem relating both to future cuts in SNFs and to tactical nuclear weapons reduction agreements concerns the nuclear weapons of third countries. Over the next few years, this issue might be addressed by their agreement to undertake a unilateral obligation to refrain from expanding their capabilities and adopt START-tested

confidence-building and transparency measures. The nuclear problems of India, Israel, North Korea, and Pakistan should be dealt with in the context of enhancing regional security and the NPT regime.

Five. As progress is made in reducing and limiting nuclear weapons, some new ways to transform nuclear deterrence should be pursued: compete elimination of the ability to execute a disarming attack and renunciation of the strategic launch-on-warning concept. These strategies have been inherited by Russia and the United States from the Cold War era and no longer reflect military and political realities. They threaten to trigger a nuclear war from third-country provocation or acts of nuclear terrorism.

The time for such measures may come upon the implementation of the New START Treaty of 2010, or following the conclusion of further nuclear weapon reductions negotiations (to a level of 1,000 to 1,200 warheads, for example), or in parallel with these, i.e., in the second half of the 2020s. A simple linear physical reduction of U.S. and Russian strategic nuclear forces to below the 1,000 warhead level might be destabilizing. On the other hand, a gradual lowering of the level of combat readiness of the strategic nuclear forces might increase the stability of the nuclear balance, making it simpler to resolve the respective issues.

Six. For the time being, measures related to the reduction, transparency, and control of nuclear weapons apply primarily to the delivery vehicles and launchers. In the future, however, the question will be raised of the controlled elimination of accumulated stockpiles of strategic and tactical nuclear munitions and nuclear materials used in these systems, which will mark a fundamentally new stage of nuclear disarmament.

As a first measure, the countries could declare the total amounts of weapons-grade nuclear materials in their possession. The transparency regime would apply only to the nuclear munitions that fall under existing nuclear weapons reduction agreements, including nuclear munitions not actively deployed or awaiting dismantlement, and weapons-grade fissile materials that the governments have pronounced superfluous to the needs of defense. The experience that Russia and the United States, as well as the IAEA, have gained from inspections conducted in Iraq and South Africa could be used to institute an inspection procedure.

Seven. The lack of systemic principles in reinforcing the regimes of nonproliferation has led to a situation in which different stand-

ards of measure are frequently proposed by governments randomly and subjectively, not in keeping with any system of priorities or international relations. This has turned nonproliferation efforts into an arena for political, economic, and military competition and for applying double standards.

Still, all states but four belong to the Nuclear Non-Proliferation Treaty, and the four outsiders already possess nuclear weapons. In other words, further proliferation can only occur if a nation violates the Treaty secretly or openly withdraws from it under Article X and subsequently creates nuclear weapons. This logically suggests which main avenues should be used to close down the channels of proliferation. First of all, the effectiveness of the IAEA safeguards should be improved and the Nuclear Suppliers Group export controls should be tightened; second, the procedure for withdrawal from the Treaty should be rigidly formalized and the political significance of such a step should be elevated.

The most important and immediate challenge in reinforcing the safeguard system would be to persuade all nations that to a greater or lesser degree pursue nuclear activity to sign on to the 1997 Additional Protocol on safeguards. The UN Security Council should pass a resolution requiring those states that have yet to do so to sign and ratify this Protocol. The Nuclear Suppliers Group should make this a mandatory condition for all future contracts relating to the supply of technology or materials. The IAEA should undertake active work to put integrated safeguards into practice that would allow greater effectiveness while presenting more economic guarantees. The question should be addressed of allowing a substantial increase in the size of the Agency's budget so that it would be able to perform its safeguard obligations independently and properly.

With respect to the procedure for withdrawing from the Treaty, it would be expedient for the UN Security Council to work with the IAEA in developing measures that would be mandatory and that the Council would undertake to impede any future withdrawals from the Treaty, or to mitigate its negative consequences (in particular, by retaining Agency safeguards over the nuclear activities that the nation had developed while still a participant in the Non-Proliferation Treaty).

The key method for "unlinking" the development of peaceful nuclear power from the threat of nuclear weapons proliferation should focus on the nuclear fuel cycle (NFC). It would become possible

to impede the spread of critical nuclear technologies using the fuel cycle if the nations participating in the Treaty would agree to refrain from building any new national fuel cycle enterprises, while those nations that already possess such technologies for their part would initiate a transition to a system of international NFC services of the appropriate form and preferably under IAEA auspices. Moreover, in addition to price incentives, a comprehensive system of technological measures should also be incorporated to reward those nations that renounce the NFC. The potential transition to an International Uranium Enrichment Center under the aegis of the IAEA should be accompanied by the application of the 1997 Additional Protocol to all civil nuclear infrastructure for both nuclear-weapon and non-nuclear-weapon states.

The unanimous adoption of UN Security Council Resolution 1887, which contained a number of measures designed to reinforce the NPT regime, was an important event. However, further efforts will be needed in order to establish an efficient system that deters serious violation of Treaty commitments and improves the effectiveness of collective action under the Security Council. A specific measure in this direction might be the adoption by the Security Council of a framework resolution (in elaboration of Resolution 1887), providing for an energetic response by the international community against nations that systematically violate the NPT regime and fail to comply with Security Council instructions. The Russian proposal to enhance the activities of the UN Military Staff Committee in order to strengthen the ability of the UN to support international peace and security should receive serious consideration.

Clearly, there is a close dialectic relationship between nuclear disarmament and nonproliferation. It is no coincidence that the significant positive breakthroughs that occurred in nuclear disarmament over the 1990s coincided with tangible progress in enhancing the nonproliferation regime, while the deadlock in disarmament over the decade that followed allowed the NPT regime to degrade. Although in and of itself, the process of nuclear disarmament cannot guarantee nuclear nonproliferation, it does help countries to cooperate in strengthening and developing the NPT, its mechanisms and regulations. The opposite is also true: the failure of the nuclear powers to meet their commitments under Article VI of the NPT essentially guarantees that the proliferation of nuclear weapons will continue and makes any efforts to strengthen the nonproliferation system very difficult.

One key NPT enhancement would involve an unqualified adoption by the nuclear powers of the obligation of no first use of nuclear weapons against any non-nuclear weapon country that belongs to the Treaty and has strictly observed its requirements. The next step might then be an unqualified promise by the five powers not to use nuclear weapons first against one another, i.e., application of the no-first-use principle to all of the NPT members without exception. In order for such an obligation to be made, Russian concerns about the military superiority of NATO general purpose forces and a number of other military and strategic issues would need to be resolved.

Another important connection between nuclear disarmament and nonproliferation is the Comprehensive Nuclear Test Ban Treaty, which can come into effect only upon ratification by China, India, Pakistan, the United States, and other countries. It can be expected that the verification system will achieve its minimum required level of effectiveness after a few years, which should remove the main concerns of the opponents of the Treaty, above all the United States.

Yet another disarmament-nonproliferation "interface" might be created by the Fissile Material Cut-off Treaty (FMCT). The pragmatic approach would involve conclusion of a basic treaty that would establish legally binding standards under international law to prohibit the production of fissile materials intended for creating nuclear weapons. The FMCT would have a realistic chance of success only if the prohibition of future production of nuclear materials were to be accompanied by progress in exercising control over and gradually reducing the accumulated stocks of such materials.

This could also be done on a gradual basis, by prohibiting the production of first HEU, then plutonium, and first concluding a treaty between the "nuclear five" and then increasing the number of members. It would be a significant stimulus for the conclusion of the FMCT (and for the universalization of the Additional Protocol of 1997) if the five nuclear powers were to voluntarily place all of their uranium enrichment and plutonium reprocessing enterprises under IAEA safeguards, especially since they each have declared on a unilateral basis that they would halt production of weapons-grade nuclear materials.

Eight. The growing counterforce capabilities of the precision-guided weapons of the United States (and subsequently, perhaps, of other states as well) are the objective consequence of the develop-

ment of strike weaponry and information systems and technology, and it will likely not be possible to stop or tangibly limit them in light of the broad scope of their potential application. Created from the beginning to improve the effectiveness of military counteraction against adversaries at the regional and local levels, such systems have begun to exert a destabilizing effect on military and political relations among the United States, Russia, and the other great powers. Still, the possibility that such systems could be used to execute a disarming strike against Russia have frequently been highly exaggerated.

If the two sides could muster the political will, they could reduce the problems created by high precision weapons systems in a number of ways. In particular, under the New START Treaty conventional ballistic missiles are to be counted as nuclear, which will limit the scope of their likely deployment. Since the Preamble to the Treaty recognizes the effect such systems have on strategic stability, there could subsequently be other agreements on these issues, as well as measures designed for building confidence and transparency.

Nine. The probable inception in the near future of a fundamentally new stage of outer space militarization involving the development of anti-satellite weapons of various basing modes and the placement of weapons systems into space to attack satellites or intercept ballistic missiles (and possibly, in the future, to strike targets on Earth) threatens to destabilize the global military and political situation. Over the long term, the growing threat of a space arms race, not to mention conflicts in space, will unavoidably lead to an irreversible crisis for all of the nuclear disarmament and nonproliferation regimes.

The first step in preventing this “weaponization” of space might be the adoption of a code of conduct for the nations engaged in activities in space. Such a code has already been tentatively backed by the Democratic administration in the United States. Since to identify the nature of the design and mission of spacecraft before they are launched and once they are in orbit is very difficult, the focus should instead be primarily on prohibiting the testing of systems designed to attack space objects or launch attacks from space objects (i.e., the testing of space-based BMD and anti-satellite systems of any type of deployment involving the destruction of a target, such as a satellite or ballistic missile or their components, in flight).

Ten. The Nunn-Lugar Program (followed in 2002 by the Global Partnership adopted in Kananaskis) became one of the most important spheres of intergovernmental cooperation to provide secure nu-

clear disarmament measures. The greatest achievements were seen in such areas as cooperation in the dismantling and recycling of nuclear submarines, the secure transport of nuclear warheads and spent nuclear fuel, and improvements to the security systems at nuclear storage facilities and stockpiles. There were also positive results in the areas of nuclear and radiation safety and export controls.

However, by no means every mechanism for cooperation under the Global Partnership has been developed, and implementation of the agreements has been accompanied by major problems. The projects that relate to nuclear disarmament and the physical security of nuclear facilities and radioactive materials have received only about 27 percent of the total international financial commitment made by all nations together, including Russia's contribution (dismantling and recycling nuclear submarines).

The time has come to enhance the Global Partnership with new ideas and approaches. First of all, Russia should alter its role in the Global Partnership and move from being a recipient country to a donor, especially now that the membership of this international forum is expected to increase in the near future. Russia would be able to make its contribution in the following areas: nuclear and radiological safety (continuous efforts to improve the physical protection of nuclear facilities and nuclear and radioactive materials); nuclear warheads dismantlement; nuclear reactor shutdowns; a multilateral plutonium disposition program; improvements to security at nuclear power plants and nuclear fuel storage facilities; construction of land-based, long-term nuclear submarine reactor storage facilities; safe handling and long-term storage of nuclear waste from submarines and surface ships; and improvements to the export and border control systems.

The assessments and practical proposals presented above naturally do not exhaust all of the contemporary national and international security issues associated with nuclear energy and nuclear weapons. They concern only the most important problems, which are examined in rational sequence and in conjunction with each other. In this sense, the analysis presented in this book may be considered to be a "road map" to nuclear disarmament and nonproliferation over the next decade.

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NUCLEAR RESET: ARMS REDUCTION AND NONPROLIFERATION

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English version edited
by Natalia Bubnova

Scientific and technical support — Peter Topychkanov
Design — Andrey Nikulin

Sent to print: 05.09.2012
Format: 140x215 mm
Paper: offset
Printing: offset
Print run: 1000

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classick21@gmail.com

Printed in «CHEBOKSARSKAYA TIPOGRAFIYA №1»
15, I. Yakovlev, Cheboksary,
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The collective volume “Nuclear Reset: Arms Reduction and Nonproliferation” presents an important and interesting contribution to nuclear reduction and nonproliferation studies. A group of world-renowned Russian experts, authors of numerous important publications, set out their vision of how to tackle problems caused by the lack of significant reductions and the continuing proliferation of nuclear weapons. They attempt to respond to what is perhaps the most pressing issue of our time – whether a nuclear reset will take place.

When six years ago the Carnegie Moscow Center published the monograph “Nuclear Weapons After the Cold War,” the book enjoyed huge popularity in Russia as well as in other countries. There is every reason to believe that the present monograph, which is the logical continuation of that book, will be no less popular and will be especially sought by all those interested in the issues of nuclear disarmament and nonproliferation.

The authors share the same approach to nuclear disarmament, which allowed proposing a set of rational, coherent, and interconnected steps that can help humankind get closer to its much cherished dream – a world free of nuclear weapons.

The study proposes a unique set of recommendations. Should the international community decide to follow them, it can achieve a breakthrough in nuclear reductions and nonproliferation. This makes the book valuable in practical terms as well.

Viktor Esin, Ph.D. in Military Sciences, professor at the Academy of Military Sciences of the Russian Federation, retired colonel general and former chief of staff of the Russian Strategic Rocket Forces.

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