Ensuring Strategic Stability in the Past and Present:
Theoretical and Applied Questions

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Foreword by Graham Allison

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Table of Contents

Foreword by Graham Allison: 2

Introduction: 4

Chapter 1:
On the Path toward Defining Strategic Stability 10

Chapter 2:
On the Principles and Parameters of Strategic Stability 20

Chapter 3:
Challenges of Ensuring the Capability for a Guaranteed Response Strike and Demonstrating Such a Capability 26

Chapter 4:
Challenges of Preventing Accidental or Unsanctioned Use of Nuclear Weapons 29

Chapter 5:
The Goal of Preventing Escalatory Domination 30

Chapter 6:
On Tactical and Operational-Tactical Nuclear Weapons 33

Chapter 7:
Nuclear Deterrence as a Combination of "Vulnerability-Invulnerability" 34

Chapter 8:
A Set of Measures for Ensuring Strategic Stability as an Example of an "Asymmetric Response" to Ronald Reagan's Strategic Defense Initiative 36

Chapter 9:
Latest Trends in the Development of Nonnuclear Weaponry, the Forms and Methods of Conventional Combat and their Impact on Strategic Stability 41

Chapter 10:
Challenges of Non-Proliferation of Nuclear Weapons, Delivery Vehicles and Fissile Materials 44

Chapter 11:
Selected Observations on the "Dyad" Relationship Between the Russian Federation and the United States 49

Chapter 12:
The Role of Other Nuclear Powers, Which Are Also Members of the UN Security Council, in Defining the Formula for Strategic Stability 51

Chapter 13:
Challenges of Limiting Anti-Submarine Warfare 55

Chapter 14:
The Role of Imbalances on the Level of Conventional Forces and Weapons 56

Chapter 15:
On the System of "Pre-Nuclear" Deterrence for Russia 57

List of Abbreviations: 60

End Notes: 62

Foreword by Graham Allison

The global nuclear order is reaching a tipping point. Several trends are advancing along crooked paths, each undermining this order. These trends include North Korea's expanding nuclear weapons program, Iran's continuing nuclear ambitions, Pakistan's increasing instability, growing doubts about the sustainability of the nonproliferation regime in general, and terrorist groups' enduring aspirations to acquire nuclear weapons. Andrei Kokoshin, deputy of the State Duma and former secretary of Russia's Security Council, analyzes these challenges that threaten to cause the nuclear order to collapse in the following paper.

Kokoshin's skills as one of the most thoughtful shapers of Russian security and defense policies are fully applied to the issue. He notes that there is a real possibility that non-state actors can acquire nuclear weapons. He warns that consequences of a successful nuclear terrorist attack would be catastrophic for both the targeted country and for the international political system as a whole. I cannot agree more. If Pakistan were to lose control of even one nuclear weapon that was ultimately used by terrorists, that would, as U.S. President Barack Obama has said, "change our world." It would transform life in cities, shrink what are now regarded as essential civil liberties, and alter conceptions of a viable nuclear order. That Osama bin Laden has been killed and al Qaeda has been significantly weakened by the U.S. government's relentless and focused attacks is good news. The bad news is that al Qaeda remains active and its new leader Ayman al-Zawahiri—who has supervised this terrorist organization's WMD programs—is vengeful.

Kokoshin also warns that acquisition of nuclear weapons by new states will not only sap the existing non-proliferation regimes, but will also dramatically complicate the global system of strategic stability based on traditional nuclear deterrence. Rather than pair up in deterrence "dyads" as the United States and Soviet Union did during the Cold War, each new member of the nuclear club would be trying to deter several countries—presenting an unprecedented challenge of what Kokoshin calls "polygonal" deterrence. I concur with the author's assessment. Acquisition of nuclear weapons by Tehran is most likely to trigger off a cascade of proliferation in the Middle East, with Saudi Arabia and Egypt leading the pack. And a nuclear Egypt will surely spur the Syrian regime's nuclear aspirations. While Saudi Arabia and Egypt would be deterring Iran, the latter would be deterring the United States and Israel in what will make this new system of polygonal deterrence extremely unstable. A multiparty nuclear arms race in the Middle East would be like playing Russian roulette with five bullets in a six-chamber revolver—dramatically increasing the likelihood of a regional nuclear war.

While grappling with the challenges that Tehran poses to the existing nuclear order, Kokoshin hits the bull's eye when he notes that testing of medium-range missiles by Iran makes military-strategic sense only if these missiles carry nuclear warheads. While Iran's President, Mahmoud Ahmadinejad, vows to "wipe Israel off the map," strategists must consider the fact that any nuclear tipped missiles in Iran will initially be highly vulnerable to an Israeli or U.S. preemptive strike. The same will eventually become true for Israel, whose military's ex-chief of staff, Dan Halutz, has referred to Iran as "Israel's sole existential threat." The same kind of crisis instability may develop in the nuclear relationship between Iran with Saudi Arabia and Egypt.

Kokoshin, who has spent decades helping to formulate Russia's defense policies, describes other challenges to strategic stability as well, including the development of ballistic missile defenses, incapacitation of early warning or targeting or navigational systems, and breakthroughs in research and development that devalue existing nuclear weaponry systems. Kokoshin's writing is instructive for those of us trying to understand the rationale behind Russia's response to U.S. missile defense plans in Europe. The proposition that offense and defense are inextricably connected in the realm of strategic stability holds as true in the eyes of Russian policy-makers as the law of gravity, even though many in Washington see the sword the United States has, and the shield it is now building, as belonging to separate realms. In Russia's view, U.S. assurances that the planned missile defenses will not target Russian strategic nuclear forces do not repeal the law of gravity, and Russia's capability to deliver a retaliatory strike will be eventually called into doubt as these defenses develop. To prevent loss of this capability, Russia will have to further modernize its strategic offensive forces, goes the Russian argument, as comprehensively presented by Kokoshin.

Kokoshin's grasp of these cardinal challenges makes this paper a must-read, not only for scholars of Russia's policies in the sphere of international security, but also for practicing policymakers in the field of non-proliferation around the world.

Introduction

As the United States and Russia consider moving beyond the New START treaty to reach new accords on the limitation and reduction of nuclear arms and the non-proliferation of weapons of mass destruction (WMD), we should recall the principles of ensuring strategic stability. How strategic stability can be achieved and how it should be achieved are particularly relevant questions today, given the tentative stability of the global super-system of military-political and military-strategic equilibrium in its current context, which includes the impact of the global financial-economic crisis on multiple levels.[1]

The U.S. presidential administration has declared its commitment to radical reductions in global nuclear arsenals and to a world free of nuclear weapons, but many politicians, experts, members of Congress, and military leaders have met this declaration with skepticism.

In thinking about how to ensure strategic stability, we should consider the medium-term and long-term trends and development patterns of various weapon systems, as well as dynamics of change in the following: international politics (including systemic and structural changes); developments in military theory; developments in military and political environments; the psychology of decision-makers; and a number of other factors.

It is extremely important to understand the patterns associated with the technical evolution of military technologies and dual-use technologies. It is also important to identify the developmental cycles associated with different components of the parties' offensive and defensive strategic forces.

Overall, strategic stability is a complex multi-political and multidisciplinary problem that requires the constant attention of political and military leaders, national experts who research national security issues, and scientists representing different fields.

The author could not have possibly covered all questions related to this topic in this paper and, therefore, has focused on matters that, in his opinion, constitute a priority for the national security of Russia under current military-strategic and military-technical conditions.

To a great extent, Russia's national security can be ensured by attaining a certain level of mutual understanding with a number of other leading actors in the modern global political system.

This task can be completed through active political dialogue with state actors—dialogue that should be conducted on multiple levels, with certain roles assigned to scientists, as was the case in the 1980s, when the Soviet leadership believed that the contribution of scientists was very important, and then-secretary general of the Communist Party of the Soviet Union Yuri Andropov personally sanctioned it.

One of the most important elements of ensuring strategic stability is the material basis for nuclear and nonnuclear deterrence. As academician Yuri Trutnev rightfully observes, "a material basis means the weapon system defines the doctrine that exists in reality as opposed to the declared doctrine."[2] One vital condition for conducting an effective national security policy is the absence of a gap between what Trutnev defines as the real doctrines and the declared doctrines.

Ensuring that there is no such gap is no easy task. It requires knowledge and skills applicable for the transformation of political (and, in certain instances, political-ideological) directives into formulas for the development of concrete weapons and military hardware. This, in turn, requires an understanding of how the components of existing weapon systems will ensure the required qualities of these systems—for example, the invulnerability of a land-based missile system. One of the complexities associated with this process is rooted in the fact that those who formulate political directives (and they are often under the strong influence of ideologems) do not always clearly understand the modern operative-strategic environment and the military-technical environment, and do not always have qualified experts and scientists at hand to advise them.

In this paper, the author outlines his thoughts on a new configuration of the strategic nuclear forces of the Russian Federation that would feature certain weapon systems and support systems. The author also once again brings up the issue of creating a system of "pre-nuclear deterrence" in the Russian Federation.

Nuclear weapons are an extremely important factor in ensuring not only Russia's national security, but also the country's real sovereignty and its status as one of the world's great powers. However, excessive reliance on these weapons, including reliance at times of acute international crises, would be counterproductive and even dangerous. Therefore, we must be as precise and realistic as possible in defining political, military-political and operational strategic objectives and targets—above all, when contemplating policy in the post-Soviet geographic space and adjacent regions.

Strategic stability studies have been recently put on the back burner and moved below the radar screen of the majority of political and military leaders, to say nothing of the general public. The high level of strategic stability reduces uncertainty in the relations of the corresponding nuclear states and enables political leaders of all ranks to focus on solutions of other problems that emerge in their countries or in the world as a whole. A high level of strategic stability also creates opportunities for the democratization of inter-state relations and of the overall global political system.

As stated above, strategic stability is a complex interdisciplinary subject that has incorporated elements from the natural sciences and technical engineering. As a whole, however, it constitutes a subject of political science and political psychology, neither of which, unfortunately, has been sufficiently developed in Russia.

The complex and multi-dimensional nature of this subject should not serve as an excuse for ignoring it. This subject ought to be studied by political leaders, state bureaucrats, military leaders, scientists and experts in various fields, to say nothing of weapon designers in the defense industry, the scientific community, the Ministry of Defense and the Security Council of the Russian Federation.

The maxim formulated by imperial Russian commander Alexander Suvorov that "every soldier must know his maneuver" can be applied to the task of ensuring not only national security as a whole but also strategic stability in particular. Realization of this maxim requires the conscious, task-oriented efforts of thousands and thousands of people. Whether strategic stability is ensured or undermined depends on whether the development of entire weapon systems, their individual components, and their support systems is a success or a failure.

Integrated man-machine systems of intelligence, targeting, surveillance, communications, data processing, data analysis, command and control—as well as information-security systems that protect communications systems not only from foes but also from various internal fluctuations—all play increasingly important roles in all of this.

The purpose of this paper is not to examine all of the aforementioned components, as such an examination would require a far more voluminous effort by a large, inter-disciplinary group of authors. This paper only outlines the author's opinion regarding the main questions on which those in charge of Russia's national security should focus.

The past few years have seen the emergence of an entire set of threats against strategic stability. These threats are chiefly associated with the proliferation of nuclear weapons; however, some are rooted in such grave phenomena as international, trans-border extremist organizations that use terrorist methods and propagate terrorist ideology. These organizations are clearly striving to acquire nuclear weapons and other means of causing mass destruction.

The possibility that such organizations may acquire and deploy nuclear weapons and fissile materials in terrorist attacks has been classified as a supreme threat not only by experts, but also by state leaders, including the presidents of Russia and the United States. As a result, the "nuclear subsystem" of the global political system has been intruded upon by a new category of actors who differ radically from such players in the global order as the nation states that still hold the monopoly on nuclear weapons. Although this intrusion has been virtual thus far, it has already exerted an impact on practical policies.

There is quite a high probability that extremist political organizations which use political methods in their struggle will acquire nuclear weapons, as evidenced by the transition that these organizations have made to the "mega-terrorism" instantiated by the 9/11 attacks on the United States.[3]

Just as real is the danger of terrorists acquiring biological and chemical weapons for use in acts of mega-terrorism. The overwhelming majority of experts seriously doubt that traditional "deterrence through intimidation" will work against non-state extremist actors, especially networks.

I could say that today strategic stability is more dependent on whether there will be violations of regional stability, given the possibility that a regional clash can escalate to a stage where nuclear weapons will be used—for instance, between India and Pakistan, Israel and Iran, or other such traditionally adversarial states. The situation in the Far East is increasingly alarming due to the incremental transformation of North Korea into a nuclear missile state.

Several years preceding the election of Barack Obama to the presidency of the United States saw a deterioration in relations between the U.S. and Russia. That deterioration made the challenge of ensuring strategic stability even more relevant for the "dyad" relationship between Russia and the United States in this sphere. There is much evidence to indicate that in spite of the growing role of other aforementioned factors, it is this relationship that military-political and military-strategic stability in the global order continues to depend upon.

Russia has to tackle the challenge of ensuring strategic stability in the dyad dimension—that is, in the Russian-U.S. relationship—under much more radical circumstances than was the case during the existence of the two global superpowers.

The course toward creation of the innovative economy declared by Russia's state leadership has must become one of the top priorities for federal authorities, regional authorities and state corporations. The private sector must also be convinced and incentivized to help create such an economy. Nevertheless, to date, Russia's big businesses have largely avoided this issue. Russian GDP is 6 to 7 times smaller than U.S. GDP, and also the quality of Russia's GDP is such that it contains almost no innovative components. The balance of forces and assets in the sphere of conventional arms and the balance of general-purpose forces between Russia and United States are now also tilted far more in favor of the U.S., especially if we factor in the overwhelming superiority of the United States in the informational and communications component of military might—as well as in everything that facilitates command and control on the strategic, operational and tactical levels.

The gigantic superiority of the United States and its main allies in general-purpose forces and means, as well as in conventional weapons (and their ability to use those in any parts of the world), calls into doubt the logic behind the calls for a world free of nuclear weapons by many leading U.S. politicians (starting with President Obama).

In these circumstances, Russia has more than ever to rely on nuclear deterrence, applying different methods to ensure the credibility and plausibility of this deterrence. Over time, Russian strategic nuclear forces will be all the more inferior to U.S. strategic nuclear forces, which will lead to certain political-psychological and military-strategic consequences.

Still, calls for a world free of nuclear weapons may become quite an important factor in international politics. They may also become a lever with which to exercise influence on Russian nuclear policy. In addition, the goal of transitioning to a nuclear-weapons free world is one of the important provisions of the Nuclear Non-Proliferation Treaty (Article 6), the importance of which cannot be overestimated. Mohamed ElBaradei, who was a very competent director general of the International Atomic Energy Agency (IAEA), noted in a 15 May 2009 interview that the number of nuclear states will double unless leading powers take radical steps to further downsize their nuclear arsenals. In 2009, French President Nicolas Sarkozy and British Prime Minister Gordon Brown announced plans to reduce their countries' nuclear arsenals (while not abandoning plans to modernize those arsenals). Sarkozy announced this plan during the launch of Le Terrible, France's newest strategic submarine. As for Brown, he announced that Great Britain will halve the number of its warheads compared to the arsenal it had in 1997.[4]

The New START treaty has improved the political climate in Russian-U.S. relations.

But with or without this treaty and improvement in the relations with the United States, the paradigm of Russian behavior should be changed to correspond with the new military-political, military-strategic and military-technical realities.

The problems of ensuring both global and regional strategic stability must be nowadays considered in terms of the interrelationship of those factors with the challenges of preventing the proliferation of nuclear weapons. In a move that is causing very serious concerns in Russia and China, the U.S. leadership is justifying its plans for the development of missile defense systems and establishing new positioning areas for these systems by invoking the prospective emergence of new nuclear states—most prominently, Iran and North Korea. Although such states would have relatively small arsenals of nuclear missiles, their military-political and military-strategic behaviors would be difficult to predict, compared to the behavior of the oldest members of the nuclear club—the Russian Federation, the U.S., China, France and Great Britain—as well as that of the club's most recent members, such as India and Pakistan.

The author would like to note that the problem of ensuring strategic stability in contemporary conditions must be solved in part by developing programs and concrete measures that are asymmetric in nature. These problems must be examined in the context of the new system of geopolitical coordinates that has essentially emerged before our eyes over the past 10 to 12 years.

Strategic stability can be ensured with greater reliability if the process is thought of within the same paradigm, relying on the logic of thinking that is common in contemporary scientific culture, and standing firm on the soil of modern scientific knowledge, refusing to yield to admonitions by charlatans and adventurists who, as a rule, pursue their own selfish goals.

We should watch out for possible breakthroughs in the development of different technologies, means of destruction, and weapon systems that can undermine the balance one way or another, creating circumstances under which the opponent may become able to surprise us in the military-technical and operational-strategic domains that arise in crisis situations. This applies not only to military technologies, but also to technologies that initially appear to be completely civilian in nature.

The scientific approach to the issue (the author refers here to both the natural and the social sciences) doesn't always boil down to questions of common sense. With the help of science, one can sometimes come to conclusions (and this applies to the problem of strategic stability too) that may run contrary to the everyday perceptions of a person who is not interested in science, contrary to his understanding of what appears on the surface to be rational from the point of view of common sense.

There are certain cycles in the development of both missile defense and strategic offensive weapons. These technical systems, which play very important roles in life-and-death issues faced by modern civilization, as well as in ensuring the national security of existing states, develop in clearly non-linear patterns.

Politicians who must deal with the issue of strategic stability do not need advanced educations in the natural sciences or engineering, but they do need to know the overall scientific logic of creating, operating and developing complex social and human-machine systems if they are to understand the patterns of technical evolution that define, to a large extent, how strategic stability is ensured. The state leadership must be able to rely on a sufficiently robust national community of technocrats when solving problems related to this issue.

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Chapter 1: On the Path toward Defining Strategic Stability

The USSR and United States de facto crafted the main elements of the approach toward strategic stability in the sphere of nuclear weapons in the period that began in the late 1960s, when they launched a serious discussion on problems of reducing and limiting strategic weapons, including both offensive and defensive weapons (although different terminology was used in the discussions that took place in the 1960s and 1970s).

Those discussions took place at a time when there were formidable differences in the structure of Soviet and U.S. strategic nuclear forces, as well as in the two sides' political and strategic cultures. But these differences were neutralized by the fact that the elites on both sides (which included increasing numbers of technocrats and neo-technocrats) recognized the reality of technological evolution in the domain of nuclear missiles—an evolution whose logic was identical to the logic of scientific and technical development. By that time, both sides had also developed and accumulated assessments of the incredibly devastating consequences that a war with use of nuclear weapons would entail. These assessments, which political leaders on both sides were able to comprehend, played an important role in the aforementioned discussions.

The majority of the political elites and military-industrial complex leaders began to view nuclear war (to be more precise, a war with massive use of nuclear weapons) as suicidal, even as both sides continued to work at an increasingly fast pace on the development of advanced means of waging nuclear war. These leaders' perceptions were in part shaped by their memories of the horrors of World War II; they remembered that the Soviet Union and the United States were allied in the fight against the Nazis. Their memories of the October 1962 Cuban Missile Crisis were also fresh. Back then, the Soviet Union and the United States found themselves on the brink of a nuclear war with each other.[5] (Some estimated that a nuclear war between the Soviet Union and the U.S. would have killed 100 million American and Soviet citizens while causing many millions of casualties in Western and Eastern Europe.)[6] In the aftermath of that crisis, a hotline was established between Moscow and Washington in June 1963, and this hotline is operational to date. Also, in August 1963, the Treaty banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water was signed in Moscow in what became an important contribution to the cause of strengthening strategic stability. And in 1968, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was concluded. Article VI of that treaty committed the nuclear powers "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control." (For instance, while developing its nuclear weapons, India was continuously criticizing the USSR and the U.S. for not properly fulfilling their Article VI commitments.) As for countries that had no nuclear weapons as of 1967, they committed to not seeking such weapons by signing the treaty. Four American thinkers (George Shultz,[7] William Perry,[8] Henry Kissinger,[9] and Sam Nunn[10]) wrote a widely acclaimed article titled "A World Free of Nuclear Weapons" that was published in the Wall Street Journal on 8 January 2007. That article, to which the author has referred above, underscores that the NPT commits all nuclear powers that have signed this treaty to rid the world of nuclear weapons.

In the current context, many call into doubt the effectiveness of this treaty, and they do so for good reason, even though 189 states have already joined it (including some 40 states capable of developing and producing nuclear weapons, according to estimates by Harvard University's Belfer Center). These doubts have only grown after India and Pakistan became nuclear powers, while North Korea carried out a number of tests of nuclear devices and missiles designed to carry warheads. But none has so far come up with an alternative to this treaty and the non-proliferation regimes associated with it. These regimes clearly need to be strengthened and developed.

Scientists, military leaders and then political leaders in the USSR and the U.S. began to formulate the provisions of strategic stability after a dramatic increase in the capabilities of Soviet and American strategic nuclear forces and the intensification of research, development and experimental design in the missile defense domain in the late 1950s and early 1960s.

Both the U.S. and the Soviet Union were conducting wide-scale work on developing missile defense systems, including development of interceptors carrying nuclear warheads. Such projects were among the priorities of the famous Design Bureau-11 (it was later renamed as The All-Russian Research Institute of Experimental Physics) in the Russian city of Sarov. At the same time, Soviet weaponry designers were developing warheads for strategic ballistic missiles that would be capable of withstanding the destructive effects caused by the explosion of a nuclear warhead carried by an interceptor that would be fired by the foe's missile defenses.[11]

The initial results of this work on the development of interceptor missiles were encouraging from both the technical and even the operational-tactical points of view. One such result was achieved by a group of designers led by Pyotr Grushin. This group developed the V-1000 interceptor missile, which was supposed to be deployed as part of experimental ground-based system of missile defense codenamed "A."[12] Grushin's Experimental Design Bureau solved a number of problems that were unique in their complexity when designing this missile jointly with the country's leading scientific research organizations. In 1967, the V-1000, which carried a high-explosive fragmentation warhead, intercepted a long-range ballistic missile flying at a speed of more than 1,000 meters per second. The V-1000 warhead exploded on time with its fragments hitting the ballistic missile.

Further on, however, greater attention was paid to the development of an interceptor missile armed with nuclear warheads.

Among national missile defense projects of that period, the author would like to single out the Taran system, which was being developed by the design bureau led by Vladimir Chelomei, who at that time focused mainly on the development of the ground components of strategic nuclear forces of the Soviet Union—the Strategic Missile Forces.[13] At that time, large-scale work was underway on the Project A-35 missile defense facility. Grigory Kisyunko led that work.

The initial design of the Taran provided for three ranges of interception of enemy ballistic missiles. At the longest range, above the northern frontiers of the Soviet Union, interception was to have been carried out by an interceptor missile designed on the basis of Chelomei's medium-class UR-100 missile, which could carry a 10-megaton warhead.[14]

The medium range was programmed to intercept warheads at a distance of up to 1,000 km by a missile that was also to be based on the UR-100. The interceptor missile was to have been equipped with a warhead that would have a somewhat lower yield but a more-precise targeting system. These medium-range missiles were equipped with a targeting system that provided for the warhead to home in on the target with the help of radio commands at the final stage of interception.

As for the short-range project, this missile was to have relied on a modification of the S-225 system that was developed by Design Bureau No. 1 under the leadership of A. A. Raspletin. (Raspletin was succeeded by weaponry designer B. V. Bunkin, who successfully led the bureau for many years.) The long- and medium-range components of the Taran were also capable of intercepting spacecraft at low orbits and could therefore be deployed to destroy satellites. The radar support for the system was to have been provided by an entire row of multi-channel radar stations of the TsSO-S type developed by the Alexander Mints Radio-Technical Institute.

Taran's concept was completed in July 1964. However, the work on this project was stopped after Nikita Khrushchev had to resign from his posts in the leadership of Soviet Union. (Khrushchev's son Sergei worked in Chelomei's design bureau upon graduating from the then- Bauman Moscow Higher Technical School.)[15]

After this development, ballistic missile defense efforts focused fully on development of the A-35 and its further modifications.[16] The work on this system was led by a collective of designers under Kisyunko's leadership. In the 1960s, Kisyunko also presented project Avrora, which would have enormous implementation costs. (The decision to allow Kisyunko to develop and present a concept for such a system was made in 1965).[17] Kisyunko proposed to create Avrora in three states to first shield Moscow, then the European part of the Soviet Union, and then the Asian part of the Soviet Union. Kisyunko proposed the deployment of two circles of decimeter- and centimeter-range radio stations designed by the Alexander Mints Radiotechnical Institute for the detection of targets and their acquisition by interceptors.[18] (At that time, it was becoming increasingly evident that deployment of a national missile defense system would incur costs at once gigantic and immeasurable. This opinion was, for instance, reflected by Marshall of the Soviet Union Ivan Konev, who told one of the sessions of the Soviet Defense Council that designers wanted to bankrupt the country through such projects.)[19]

As was the case with the Taran, the Avrora project also provided for the use of nuclear warheads on interceptor missiles, since it was believed that such a configuration would lead to a solution to the so-called "nuclear selection" problem.[20] The initial design of Avrora had been completed by the summer of 1967.[21]

The next stage in the work done in the Soviet Union on the missile defense was development of system A-135, which was implemented in such a way as to ensure compliance with the 1972 ABM treaty.

Computer systems developed by groups of designers led by V. S. Burtsev and Lebedev became crucial components of each of the aforementioned systems. A group of designers led by Anatoly Basistov played a lead role in the development of the A-135 systems. Basistov also made a very substantive contribution to the development of operational-tactical assessments and concepts associated with the missile defense of Moscow (even though it was the General Staff of the Soviet Armed Forces and the command of the country's Air Defense Force that were supposed to develop these concepts).

By the late 1960s and early 1970s, both the Soviet Union and the United States had come to realize that their hopes of developing missile defense systems with the capability of shielding national territories from anything amounting to a wide-scale nuclear strike were mere illusions (and that such systems would incur ultra-high costs). Also, designers contemplating the use of nuclear warheads on interceptor missiles, which leaders of both superpowers had great expectations for, encountered serious problems. The latter were rooted in the fact that Moscow and Washington had earlier contemplated mostly land-based systems, but some designers on both sides had already begun to develop concepts of ballistic missile defense (BMD) systems that would feature combat stations in space.

It is based on the understanding of the entire set of these problems associated with development of BMD systems (as well as on an entire series of systemic analytical reports that had been completed) that U.S. Secretary of Defense Robert McNamara proposed to Soviet prime minister Alexei Kosygin at their meeting in Glassboro, New Jersey, that limitations be placed on the U.S. and Soviet missile defense systems.[22] McNamara was trying to prove in the late 1960s that neither the Americans nor the Soviets needed any wide-scale missile defense. Moreover, McNamara argued, an almost dangerous situation would emerge if both sides came to believe they could be shielded from a retaliatory strike, because such beliefs would entail a much faster pace of crisis escalation. The U.S. secretary of defense also tried to draw Kosygin's attention to the fact that a national missile defense would incur enormous costs. However, Kosygin was not convinced. At a press conference following his discussion with McNamara, Kosygin said the following: "…what weaponry should be considered as a factor that enhances tensions—offensive or defensive? I believe that defensive systems that prevent an offensive are not the cause of the arms race, but are rather a factor that prevents human deaths. Some make the following argument: what is cheaper to possess—offensive weapons that can destroy cities and entire states or defensive weapons that can prevent such destruction? Theories are currently circulated in certain quarters that one should develop the cheaper of the two systems. Among other issues, 'theoreticians' of such a type debate how much it may cost to kill a human being—$500,000 or $100,000. It may be the case that a missile defense system costs more than an offensive system, but it is designed to save human lives rather than to kill people … . There are ways to solve the security problems and these ways are much more reliable and they could accommodate the needs of humankind. You know that we are speaking out for putting an end to nuclear armament and for elimination of nuclear arsenals."[23] Soon enough, however, the Soviet side accepted the logic according to which MD systems should have been viewed as destabilizing, because a number of leading Soviet scientists and specialists developed such views on the role of these systems.

A special research group headed by Morton Halperin from Harvard in 1968–1969 studied the long-term perspective of the strategic balance between the United States and the USSR, having analyzed such components as numbers of ballistic missiles, strategic aircraft, and nuclear warheads with delivery vehicles. The group analyzed the balance of forces and the possibility of changing the balance in conventional weapons. It analyzed the scientific and technological capabilities of both sides, as well as the economic and political factors associated with the development of the military forces of the U.S. and USSR. According to Halperin, "we came to an inevitable conclusion that none of the existing American strategic programs could give us the predominance that we had in the 1950s." Based on the Halperin group's report, Henry Kissinger—who used to work with Halperin at Harvard, and who became the national security advisor to the president of the United States in 1969—came to the conclusion that strategic predominance of the United States over the USSR was unattainable, at least in the 1970s. Kissinger shared this opinion with President Richard Nixon, who agreed with that conclusion (based on the data and estimates provided by other sources, and on his growing confidence in Kissinger's thoroughness, logic and academic gravitas).

It should be recalled that at that time Kissinger developed and introduced the Five Polar Power World formula (U.S., USSR, China, Western Europe and Japan), which was supported by President Nixon. This formula played an important role: it helped the United States to come out of the deepest foreign policy and political-military crisis of that period, and to conclude a series of treaties between the United States and the USSR. It also ensured a breakthrough in U.S.-Sino relations, which made the U.S. defeat in Vietnam less painful.

In 1972, five years after the U.S.-USSR Glassboro Summit, President Nixon and General Secretary of the Central Committee of the Communist Party of the Soviet Union (CPSU) Leonid Brezhnev met in Moscow and signed the ABM Treaty together with an Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms. The ABM Treaty Protocol, which was signed in 1974, provided for further limitation of the parties' activities in this area.

The political and military significance of the ABM Treaty was enormous. It became a textbook example of thorough elaboration on a large variety of military, technical and legal issues. Based on strict observance of the principle of equality and equal security of the parties, the treaty imposed significant and strict limitations with respect to the quantity, structure of certain components, qualitative characteristics and deployment of the missile defense (MD) systems of the USSR and the United States. It prohibited the development, testing or deployment of other kinds and types of MD systems, whether sea-based, air-based, space-based or mobile land-based, along with the development of MD systems covering the entire territory of the country or their deployment beyond the national territories of the two countries. For more than a decade, these limitations actually blocked the build-up and modernization of arms in this area; however, these limitations did not prohibit the development of a number of technical projects in laboratories and design centers. In accordance with the ABM Treaty, each party was allowed to deploy its MD systems or their components only in two areas with a radius of 150 km. At each deployment site there could be no more than 100 interceptor missiles and 100 launchers.

The treaty also stipulated quantitative and qualitative limitations with respect to ABM radars at each of the two aforementioned sites. It was prohibited to develop, test or deploy ABM launchers designed to launch more than one ABM interceptor missile at a time from each launcher; to equip missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, with the capability of countering strategic ballistic missiles or their elements in flight trajectory, or to test them in an ABM mode; or to deploy radars for early warning of strategic ballistic missile attack, except along the periphery of the national territory and oriented outward from that territory.

To consider the questions concerning compliance with the assumed obligations and to improve the viability of the Treaty, the parties established a Standing Consultative Commission based in Geneva. Pursuant to the ABM Treaty Protocol signed on 3 July 1974, each of the two parties undertook to have only one of the two ABM deployment sites stipulated by the Treaty. The Soviet Union chose to maintain its ABM defense of Moscow, and the United States chose to maintain the defense of its ICBM Minuteman launch base at Grand Forks, North Dakota. The parties had the right to reverse their original choice of an ABM site and to deploy their ABM systems or their components in the other area stipulated by the Treaty (i.e., the U.S. could redeploy its ICBM launch silo system and the USSR could redeploy the system that was protecting its capital), provided that they dismantled or destroyed the system deployed in the originally chosen area. It was anticipated that the MD system covering the ICBM base would considerably improve the combat stability of this land-based component of U.S. strategic nuclear forces. Explaining the reasons why the United States decided not to deploy the MD system to protect the U.S. capital, American politicians said that due to domestic policy reasons, no U.S. president could agree to protect the capital without protecting other large cities of the United States. Moreover, from a military and technical standpoint, protection of such objects as ICBMs located in hardened launch silos was an easier task compared to protection of such a soft target as a large urban population center. Deployment of an ABM system around Moscow was and still is justified by the fact that this system makes it possible to increase the degree of uncertainty for an attacker who wishes to launch a preemptive decapitation strike on the country's government and military command. In 1976, the high maintenance costs and limited capabilities of the system forced the U.S. to shut it down. The main ABM radar station at Grand Forks became part of the North American Aerospace Defense system, or NORAD.

The 1972 ABM Treaty stated that the ABM system should be only land-based and stationary. In this regard, the Treaty permitted the "advanced development" of ABM systems and components "based on other physical principles," so long as they were land-based and stationary, and so long as the Treaty signatories concurred on the parameters of such a deployment. In any case, those systems could be deployed only in one area.

Strict quantitative and qualitative limitations imposed with respect to ABM systems in 1972 and 1974 increased the groundlessness of any hopes for the reduction of losses in a nuclear war to acceptable levels, and therefore ruined the idea of any true victory in a nuclear war. (It should be noted immediately that this did not mean that the scientists, designers or military leadership of both sides seized upon the opportunity to find a way out of the Soviet-American nuclear stalemate.) Since it is impossible to alleviate the damage caused by the other side's retaliation strike, the first strike actually becomes senseless. While the aforementioned strategic observations related to the limitation of ABM systems were not implicitly or unanimously acknowledged in the United States or the USSR, they still played an important role in the alleviation of international tensions, since they redounded to a certain lessening of mutual fears and suspicions on the part of the two powers, scuttled the dangerous illusion that it was possible to survive a thermo-nuclear war, and disabused both sides of the notion that nuclear threats could be used in politics with any degree of effectiveness.

Thereby, the general Soviet-American approaches to securing the military strategic balance were formalized within the treaty framework, although the official bilateral documents did not specify the principles of strategic stability. (The term "strategic stability" was used in the U.S.-USSR Intermediate-Range Nuclear Forces Treaty [INF Treaty] as of 1987, and the START I Treaty as of 1991. In the course of negotiations on strategic arms reductions, the U.S. exerted pressure on the Russian side in an attempt to force Russia to reduce the quantity of heavy missiles in its arsenal with a large number of nuclear warheads, which the U.S. treated (despite all Russia's efforts to prove the contrary) first and foremost as a means of launching a preemptive disarming and decapitation strike. On 1 June 1990 the USSR and the United States signed a special joint statement concerning future negotiations on nuclear and space-based arms and the further strengthening of strategic stability. The statement said that future negotiations on the reduction of strategic nuclear arms should be aimed at "further reduction of the risk of war, especially nuclear war, enhancement of strategic stability, transparency and predictability by way of further stabilizing reductions of the strategic arsenals of both countries. This shall be achieved through the pursuit of arrangements that increase survivability, eliminate incentives for the first nuclear strike, and embody the relevant interrelation between the strategic offensive and defensive means." This was also the time of formulation of the principle of equality and equal security of the parties in the course of limitation and reduction of strategic offensive weapons—a principle that certainly must not be forgotten in the present-day context.

At that time, the USSR and the United States had large strategic nuclear arsenals that considerable outstripped those of China, France and Great Britain. They also had large arsenals of tactical and operational-tactical nuclear weapons, and while the number of strategic nuclear delivery vehicles possessed by the two sides stabilized in the first half of the 1970s, the number of warheads on those vehicles was increasing rapidly in the form of ICBM equipment and submarine-launched ballistic missiles (SLBMs) with multiple independently targeted reentry vehicles (MIRVs). Designers intensified the development of MIRVs that were capable of terminal maneuver, which reduced the risk of being hit by anti-missile defense systems.

Alongside the conclusion of agreements on the limitation of strategic arms, the parties continued their intensive work toward the improvement of nuclear delivery vehicles and munitions. Special efforts were (and still are) expended to increase their precision to a level that would allow them to hit hard targets, including not only ICBM silo launchers but also the relevant command and control centers, starting at the highest state level.

Designers also worked to improve anti-submarine warfare aimed at the efficient pursuit, detection and destruction of the other side's nuclear submarines, which constituted the naval component of the parties' strategic nuclear forces. The 1970s were also a time of accelerated development of non-nuclear weapons with enhanced accuracy, which could be deployed on long-range delivery vehicles that were classified as strategic delivery vehicles; together with considerable improvement of the targeting accuracy, this was considered a potential threat to a number of components of the parties' strategic nuclear forces. All these factors created a scientific and technological basis for the erosion of strategic stability.

Both sides were simultaneously developing technologies, methods and systems that could improve the combat stability of strategic nuclear forces (SNF) in the event of use of nuclear weapons by the enemy. Those concerned the following:

- Various additional options for mobile ISBM deployment (land-based mobile missile systems, rail-mobile missile systems, air-launched ballistic missiles (ALBM) and the like);[24]
- The quieting of nuclear submarines and increasing depth of their submersion;
- Improved concealment against strategic aircraft and long-range cruise missiles; and
- An increase in the ranges of submarine-launched ballistic missiles, which considerably expanded the patrol zone for strategic ballistic missile submarines.

At one point in the 1970s, a number of experts on both sides concluded it was impossible to conduct efficient antisubmarine operations against strategic ballistic missile submarines due to the intermittent increase in the range of submarine-launched ballistic missiles, which by that time practically caught up with the range of ICBMs.

Various elements of nuclear deterrence theory were also determined at that time; those were based not only on the possibility of exchanging suicidal retaliation strikes against large urban populations, but also on the possibility of attacks against other objects, which would allow the assaulter to end a nuclear conflict with one or another kind of victory.

Strategic stability was put to the acid test in the first half of the 1980s amid a general worsening of U.S.-Soviet relations (the Soviet Union sent its troops to Afghanistan and the U.S. President called the USSR an "Evil Empire," to name two examples). There was a new nuclear missile confrontation in Europe over the Soviet Union's stationing of its Pioneer medium-range ballistic missiles (MRBMs)—referred to by NATO as the SS-20—and the U.S. deployment of its MRBM Pershing II and ground-launched cruise missiles (GLCMs). In addition, the U.S. threatened to withdraw from the ABM Treaty due to its introduction of the SDI program.

It was in the decade of the 1980s that the Soviet Union began to upgrade its medium- and intermediate-range missiles and shorter-range missiles, both in Europe and the East (with a primary focus on China). In doing so, the USSR replaced the single-warhead MRBM with the technically splendid Pioneer (SS-20) system, which carried three MIRV warheads. The United States and NATO decided to deploy its MRBM Pershing II missiles and its GLCMs in Europe. The short fly-in time of the Pershing II, its high precision and its stronger capability to hit hard targets (including underground command posts), increased the degree of threat for the entire state and military-administration system of the USSR, and created a real threat that the U.S. was in a position to launch a decapitation attack on the Soviet Union. This also provided additional incentives for development of an ABM system around Moscow.

Estimating the potential military policy of Ronald Reagan and comparing it with the policies of such U.S. presidents of the 1970s as President Nixon, Gerald Ford and Jimmy Carter, one could not fail to notice that the platform of the U.S. Republican Party stated in black and white that the new round of military build-up in the U.S. should be ultimately aimed to achieve "overall military and technological superiority over the Soviet Union."[24] The Republican position could not but cause serious concern and anxiety in the Soviet Union—a consequence that was not explicitly specified in the official public documents of the Reagan Administration. However, the Soviet Union had good reason to direct its top government experts and academic institutions to carry out in-depth studies of plans by the U.S. to develop its strategic forces. The very idea of the U.S. achieving military and technological superiority over Russia became the context in which Moscow considered the SDI program put forward by Reagan.

This was a time when the threat of the arms race in outer space became feasible again, as a result of the creation of anti-satellite weapons on a new technological basis, and both sides were ready for such a race. This threat could emerge much earlier, before the creation of any large-scale anti-missile defense system as a result of R&D under the SDI program. Practically any means of anti-missile defense— even ground-based interceptors armed with both nuclear and non-nuclear warheads—is also by default an anti-satellite system. Hitting satellites that are flying in predictable and known orbits is much easier than shooting down missiles, let alone warheads protected to such a very high degree that they can avert destruction when entering the atmosphere.

Alongside various R&D activities related to anti-missile defense in the 1980s, the United States intensified its development of various anti-satellite systems, and similar activities were carried out in the Soviet Union. It was less noticeable to the general public, but many experts in both countries clearly understood that competition in the area of anti-satellite weapons was extremely dangerous. Anti-satellite weapons could create a threat to many things, including the reconnaissance satellites that constituted the so-called "national technical means of control," which became an integral part securing U.S.-Soviet agreements in the area of strategic weapons. Anti-satellite weapons would also pose a threat to the first-echelon means of missile warning systems (satellites with sensing equipment for the detection of ballistic missile takeoffs) and to a number of other elements of the satellite-based space infrastructure of both sides.

The Soviet Union warded off those threats off by means of large-scale military, technological, political and diplomatic efforts. The conceptual, doctrinal formulation of the Soviet political and military policy of asymmetric response to SDI, which will be discussed in detail later, also played an important role. As to the prevention of the arms race in outer space, first of all it is important to note the unilateral Soviet moratorium on deployment and testing of anti-satellite weapons in outer space that was announced by the General Secretary of the Central Committee of the CPSU Yuri Andropov.[25]

It was declared that the moratorium would be in force until the other side refrained from the same activities. This moratorium remained effective on a reciprocal basis until recently. It is an example of parallel arms-race limitation measures that were not legally formalized through any bilateral treaties.

In 1985, the United States conducted a test of its anti-satellite weapons, hitting a low-orbit satellite with an experimental air-deployed ballistic missile called the SRAM-Altair; however, the U.S. Congress immediately blocked further testing by cutting off the relevant appropriations. Many members of both chambers of the U.S. legislative body and distinguished experts remembered the moratorium on testing of anti-satellite weapons declared by Andropov and considered U.S.-Soviet competition in that area to be extremely detrimental and dangerous. Since then, both sides observed the mutual moratorium on such testing on a no-objection basis; the moratorium was in force until February 2008, when sea-launched missiles, pursuant to the order of the U.S. command, hit a U.S. reconnaissance satellite that had outlived its usefulness.

From the military and technological point of view, there was practically nothing new in such a demonstration of anti-satellite weapons. That U.S. satellite was hit, first of all, to demonstrate U.S. capabilities in that area and to vindicate the U.S. intention to preserve a free hand in outer space in the context of use of force and development of weapons, including anti-satellite weapons.

U.S. policy concerning activities in outer space in the 21st century, which began to shape in 2001–2002, looks similarly unambiguous. On the one hand, it proclaims the special importance of all space systems for fulfillment of civil and military tasks, and emphasizes their large vulnerability to opposing anti-satellite activities (the policy directly mentions the China's increasing anti-satellite capabilities). On the other hand, it contains distinct allusions that the U.S. itself will be developing such means of destruction, and will provide for the military protection of its own space vehicles. As a comment on the last thesis, it is more difficult to develop an efficient means of proactive defense of space vehicles than it is to develop any limited anti-missile defense system. Thus, we can assume that U.S. policy and military strategy may refer to other means and methods that do not rule out the possibility of preemptive strikes on any other countries' forces and military assets that may be deemed threatening to U.S. activities in outer space (with due regard for the principle of taking preemptive military action against any threat to the U.S. national security, which was defined in the U.S. 2002 National Security Strategy).

According to international media reports, more than a year before the U.S. hit its satellite with a sea-launched missile, on 11 January 2007 the China conducted a single anti-satellite missile test, showing the United States that, as an English proverb says, "people who live in glass houses should not throw stones." The test, conducted by China using a German interceptor missile, was a first-of-its-kind test of anti-satellite technologies in the past 20 years.[26]

A wide variety of potential anti-satellite technologies have been available for several decades. Indeed, technologies for their development have existed since the end of the 1950s (some even before then). Anti-satellite systems can be ground-based, sea-based, air-based and space-based. They may use kinetic-energy means of destruction and directed-energy weapons such as lasers and particle accelerators. They may use various electronic warfare tactics; in order to cause satellites to malfunction, there is no need to destroy them physically; it is sufficient just to blind them and to break their connection with ground control using various weapons of electronic warfare, such as electronic jamming systems. In the early 1980s, the USSR and the United States conducted very advanced R&D programs with the goal of establishing such systems. They used heavy fighters—the Soviet MiG-31 interceptor and the U.S. F-15 multi-purpose aircraft, respectively, that were armed with two-stage satellite-killer missiles designed to be launched from aircraft in the upper atmosphere in order to hit low-orbit satellites. Anti-satellite weapons also included various types of "space mines" that could be deployed in advance in relevant orbits.

Chapter 2: On the Principles and Parameters of Strategic Stability

The core of the modern military and strategic balance is its most dangerous and destructive component: nuclear forces and means, starting with strategic assets. In this context, there are very close connections among the two sides' separate offensive and defensive forces and within each of their military forces. At the same time, the stability of the balance, especially in the event of nuclear stalemate, is essentially influenced by their general-purpose forces and conventional arms.

The concept of stability is implied to estimate how easy it is to startle and destabilize a system—in this instance, the super-system of strategic nuclear interaction—out of its current state.[27] This concept logically implies an estimate of the risk of an outbreak of nuclear war, in view of the given correlation and structure of the parties' military forces and, first and foremost, the strategic potential of those forces. The main aspect of stability is the existence of a certain potential barrier that, if cleared as a result of some external disturbance, would cause the transition of the strategic military super-system into a qualitatively new state—from the typical interactions of peacetime to the interactions that are characteristic of the fundamentally different logic of military conflict, a logic that leads to a nuclear, strategic war.

This potential barrier is formed by a group of political and military factors, where the principal factor is a correlation between the following elements:

- The political and military goals of nuclear war of various scales and types;
- The capabilities of each side to use force in the resolution of crisis situations, and the currently available material and technical resources available for the prosecution of such a war; and
- The relevant consequences of using such force.

The stability of the balance is determined by the parameters, which are decisive factors in the evaluation of how easily one of the sides would disrupt the existing balance and attain superiority, and how difficult it would be for the other side to take countermeasures to restore the balance by neutralizing these steps.

The concepts of balance or equilibrium, and stability formerly reflected one in the same condition of strategic balance for each sides' forces. In the first half of the 1970s, these concepts began to differ in their meaning (the Soviet Union was several years behind the U.S. in the process of mass transition from single-warhead missiles to MIRVs).[28] The term "equilibrium" more likely reflects quantitative parameters of the existing nuclear super-system, while the concept of stability characterizes its quality. (Therefore, equilibrium, or balance, may be stable or unstable). The emergent difference does not resolve itself into the semantic nonidentity of the two concepts; rather, it is deeply practical, since it provides for the identification of the main problems that determine the increase or reduction of risk of nuclear conflicts,[29] including the risk of an outbreak of nuclear war.

Maintenance of military and strategic equilibrium with due regard for existing nuclear-missile armaments does not stipulate maintenance of the exact symmetric equality of the two sides' forces. To a certain extent, the enormous destructive capacity of nuclear weapons equalizes the differences between the parties' arsenals, as well as the technical characteristics of certain components of their strategic forces. It should always be borne in mind that a nuclear explosion is characterized not only by an extremely high concentration of released energy in an extremely short time—fractions of a microsecond—but also by a variety of adverse factors: a major part of the energy is released in the form of the kinetic energy generated by the nuclear reaction and by neutron and gamma emissions. Apart from the blast wave and heat flash, the adverse factors of nuclear weapons include penetrating radiation, radioactive contamination and electromagnetic pulse (EMP). There are six types of nuclear explosions: the air burst, the high-altitude burst (above the troposphere boundary, which is higher than 10 km), the water-surface burst, the surface burst, the underwater burst and the subsurface burst. The latter may be with or without soil displacement (the camouflet or confined explosion). The main adverse factors of a subsurface nuclear explosion include heavy seismic waves. A subsurface nuclear explosion with soil displacement is also accompanied by an air blast and severe radioactive contamination of the area. One of the characteristic features of these explosions is the formation of a crater, which may vary in size depending on the yield, depth of explosion and type of soil. Subsurface bursts are designated for high-accuracy destruction of hardened embedded structures. With present-day conditions in mind, a high-altitude burst is interesting first of all as a source of EMP and super-EMP, which primarily cause a blackout of the sensitive electronics of military and civil systems.[30] A surface burst takes place on the ground surface or at when the fireball touches the ground surface; such explosions are also designated for destruction of subsurface and hardened surface targets.

The established military and strategic equilibrium has what Alexander Vasiliev, the distinguished Russian expert on the problems of strategic stability and missile systems, once called a "safety margin." (When describing this phenomenon, Major Gen. Vladimir Dvorkin used the term "stability margin.") The existence of such a margin, and an accurate understanding of its scale, create essential conditions for maneuver in the course of negotiations on the limitation and reduction of nuclear arms and in the development of proficient, flexible approaches to the formulation of arrangements.

This safety margin, or stability margin, is to a certain extent amenable to quantitative and qualitative evaluation; it may decrease concurrent to reductions in the parties' nuclear arsenals. However, enhancement of the structure, the composition of strategic forces, and a number of other measures may provide for the preservation of the safety margin at a high level. With present-day conditions in mind, calculation of this safety margin is especially important and topical for Russia in terms of devising approaches to the development of strategic nuclear forces (SNF) and of considering whether to negotiate new limits and reductions in nuclear arms.

Generally speaking, strategic stability is based on the inability of each of the sides to deliver a preemptive or a fixed-time strike capable of disabling the major part (if not all) of the nuclear forces that other side could use in the delivery of a retaliation strike. Many experts equitably note that there is considerable technical and operational uncertainty related to the possibility of a massive synchronized strike (a salvo aimed at the mass destruction of hundreds of targets at the same time), which could lead to destruction of all ICBM launching silos. Practical experimentation on such a scale is impossible, while computer simulation cannot reduce the degree of uncertainty to a convincing level. Moreover, in the event of a nuclear strike, ballistic missiles will not be launched along their usual test-trajectories. Rather, they will be launched along combat trajectories that differ considerably from test-launch trajectories—and give little signal regarding the trajectories' end-point target on the territories of the other side. Many experts believe that this fact also increases the level of uncertainty concerning the accuracy of ICBMs, SLBMs and other missiles.[31]

There are also the problems associated with the targeting of a single target by several warheads to guarantee the target's destruction—the so-called warhead "fratricide effect"—as a result of the reciprocal influence of a heavy surface-burst by the previous warhead on the next one, due to soil particles upcast into the atmosphere. That is to say, once the first warhead explodes, the soil particles that are upcast into the atmosphere by the explosion will inevitably obstruct the pinpoint destruction of the target by the following warheads. However, any trustworthy evaluation of this fratricide effect would be an extremely difficult task.[32]

Many experts also believe that such an evaluation is practically impossible, by virtue of the existence of the Moscow Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (including nuclear surface bursts), signed by the Soviet Union, the United States and Great Britain.[33] The same applies to the operational and technical reliability of a synchronized simultaneous salvo of 1,000 missiles. This is the case when a higher degree of uncertainty for both sides increases the stability of the military and strategic equilibrium, rather than the reverse. And the relevant limiting treaty is one of the factors that provide for just such a stabilizing uncertainty.

However, even if we imagine the highest-precision effective strike that incapacitates an ICBM, such a strike would have enormous indirect consequences on the lives of millions of people, as has been demonstratively corroborated by a number of research studies. Calculations made by some American experts in the 1980s showed that in the event of a strike only on U.S. ICBMs deployed in sparsely populated areas of the United States, the number of civilian casualties primarily resulting from radiological fallout could vary from 5 million to 18 million people.[34] According to the estimates of U.S. scientists W. Dougherty, B. Levi and F. von Hippel, in the event of a 3,000 warhead attack on a wider class of as many as 1,200 military targets, the number of casualties inflicted on the U.S. population would vary from 13 million to 34 million people, depending on the air-mass direction at the time of the explosions and on certain additional factors.[35]

"Compensated"—that is, reduced—warhead yields; reductions in the number of targets to be destroyed by nuclear munitions; and enhancement of targeting precision could considerably decrease such a side effect, but still, this would mean the death of millions of people.

The situation is considered to be stable when the aggressor's anti-missile defense system cannot protect it from the attacked side's retaliation strike, which is intended to cause "unacceptable" or "comparable" damage. The estimates of many experts show that today the number of warheads that would be required to inflict unacceptable or irreparable damage to the largest state is considerably smaller than was believed earlier. Such conclusions are based on a deeper understanding of the entirety of the consequences of nuclear bursts, including secondary and even tertiary, especially in the event of nuclear blasts in large urban areas that may result in firestorms. The biomedical consequences of nuclear bursts would also play a major role.[36]

Today, the majority of Russian and foreign experts agree that the amount of unacceptable damage cannot be fixed: in each country, the degree of unacceptable damage would be determined by political, social, historical and economic factors. Moreover, even individual members of the leadership of a single country may have differing perceptions of the scale of unacceptable damage. Successful attack and victory are impossible, if the aggressor cannot prevent nuclear retaliation or at least reduce the strength of such retaliation to an acceptable level. This may be considered, on the highest aggregate level, to be the essence of strategic nuclear deterrence.

Thus, in the nuclear age, a nuclear attack's effectiveness is determined primarily by the attacker's ability to hit the other side's nuclear assets—an outcome that depends in large part on the effectiveness of the attacker's control system, both on the absolute and relative scales. In turn, a successful defense is evidenced by the ability of the strategic forces to survive, even in the event of a surprise attack, and to make a destructive retaliatory strike. This is the principal protection factor in the balance of nuclear forces. Defense is expressed as the existence of a credible potential to deter a potential aggressor, not in any actual capability to ward off such an attack. In this context, one should always bear in mind that under the influence of an entire complex of political and psychological factors, with the emergence of motives and forms of behavior that are by no means rational, even a state with a partially efficient anti-missile system may suffer the dangerous illusion that it would be able to repel a less powerful retaliation strike by the other side after that side was weakened and disorganized by a surprise nuclear attack against its strategic forces and its command and communications system. A deeper analysis of the factors and conditions associated with securing strategic stability makes it possible to note the following: the situation may be considered to be stable if each of the sides (after its forces underwent a preemptive [first] strike) is still able to restore the shattered equilibrium by disabling the relevant forces of the aggressor immediately with a first retaliatory strike. The most difficult task—from the scientific, technical, operational, strategic and administrative points of view—is to ensure the latter criterion.

Stability implies mutual confidence of the two powers in the reliability of their nuclear deterrence potentials.

Certainly, one of the most important prerequisites of strategic stability is the existence of political (and politico-military) conditions in which neither side has any incentive to use nuclear arms first. (In the current international political context, there are practically no such incentives; however, they may eventually emerge in the context of the development of a certain stage of a crisis that escalates into a nuclear conflict. Any strategic stability arising from such conditions shall be preserved for a relatively long period of time, despite such perturbing factors.)

Professional calculations of strategic stability formulas are aimed at comparing the combat capabilities of the sides (where dynamic comparison plays the most important role) under different scenarios entailing an exchange of nuclear strikes. Therefore, the calculations reckon with both the qualitative and the quantitative characteristics of the arms systems, along with the complexes and components of the strategic nuclear forces wielded by both sides. Quite naturally, each side keeps a considerable part of such qualitative characteristics a secret; however, many such characteristics were specified in the U.S.-USSR contractual documents.[37] However, the surface characteristic of the most-reviewed part of these agreements is always the number of warheads and delivery vehicles: these are the indicators that are generally used in public policy. Although equal number of warheads and delivery vehicle does not necessarily guarantee a stable situation and high strategic stability.

Strategic stability threats also include the danger of incapacitation of ground-based and space-based components of the early warning system (EWS), space-surveillance systems (designated for the detection of dangerous satellites and assignment of targets for the space defense system),[38] space communications, navigation, reconnaissance and target-assignment facilities (satellites).[39] In the modern context, this aspect of strategic stability again deserves the closest attention. Another very important factor are the SNF command and control systems that provide for launch command and control over SNF status, readiness condition and reliability.

In the modern context, the contours of the command and control systems of MWS and the SNF tactical command and control systems of the Russian Federation and the United States are divided; they are "looped" only at the level of the supreme military authority and top national leadership.

In the 1960s, when missile and space defense forces were developed, Nikolai Krylov, commander of Soviet Strategic Missile Forces (SMF), insisted that the forces, which were responsible for providing missile warnings, should become part of the Soviet SMF, rather than the Air Defense Forces. He justified his suggestion for a very limited period of time by making a decision on delivery of a retaliatory (launch-under-assault) counterstrike.[40] However, it was for good reason that such proposals by the SMF Command drew no support from the Soviet government.

According to mass media reports, there were similar ideas in the United States. However, both countries decided that it was dangerous to leave decisions on the delivery of nuclear strikes based on MWS signals to the discretion of those who would deliver such strikes, i.e., to the SNF Command.

In this paper, the author will offer only a very general overview of the activities of the missile warning system (MWS), the space surveillance system (SSS), and other aforementioned components that are, in fact, as important in many respects as the weapons themselves.

The stability of military-strategic equilibrium is ensured through unilateral military, technical, operational and strategic measures, and via mutual treaties (or agreements that are not formalized as treaties) with various compliance-verification procedures.[41] In this respect, it is extremely important to make sure that the situation is resolved in an equitable and mutually beneficial way.

In general terms, strategic stability should be defined as a condition that is ensured by the stability margins that make it possible to offset the effects of external and internal perturbing factors. Such factors may include the counterpart's scientific and technical breakthroughs that have the effect of reducing the input of certain arms systems. They may also include drawbacks in the implementation of some systems that are part of the main components of the defending side's strategic nuclear forces.[42]

As early as in the 1970's and 1980s, the United States began to consider its opportunities for deploying non-nuclear warheads, not just on long-range cruise missiles, but on ICBMs and (a short time later) on SLBMs. Thus, the issue that has been discussed this decade has had a long-standing (and in many respects informative) history in the United States. By the end of the 1970s, both sides managed to make good progress in improving the accuracy of ICBMs and the invulnerability of the warheads of their offensive missiles against their interceptors. Improved accuracy again raised the issue of the vulnerability of a number of components of the SNF, and of the tactical command and control systems of each of the sides.

Huge resources were invested in the development of anti-submarine systems, but the development of strategic missile-carrying submarines was always moving forward (as early as 1970s, there was an intermittent increase in the range of SLBMs, which considerably expanded the submarine combat control zone for missile-carrying nuclear submarines).

Chapter 3: The Challenges of Ensuring the Capability for a Guaranteed Response Strike and Demonstrating Such a Capability

In order to have the necessary safety margin for ensuring a sound retaliatory strike, Russia needs to develop a wide range of means and forces, which may be used (with a high degree of reliability) for delivering various types of such a strike, and to regularly (in doses, with in-depth analysis of the anticipated and required political and military effect) demonstrate its ability to deliver such a strike. This is exactly what the deterrence effect, the specific deterrence policy and the theory of deterrence are primarily based on.[43] There is a need for well-considered, complex, multi-option strategic gestures. It should not be pure public relations, but should rather consist of a series of well-considered actions based on Russia's actual scientific, technical, operational and strategic capabilities and achievements; otherwise, it will just do harm to the defense image of Russia. It should not only involve separate "demonstration" launches, but also the entire complex of real and virtual measures that demonstrate Russia's ability to break through the other side's ballistic missile defense (BMD) system. Such measures include the improvement of the ability of Russia's strategic nuclear forces to withstand the adversary's counterforce strikes, both nuclear and conventional. These strategic gestures must take into account the political psychology of the elite, and the population of the adversary's country. In the latter respect, it is important to understand the other side's political and military decision-making mechanisms, especially the ones that are used in crisis situations).

Each of the sides must understand that the retaliatory actions of whichever side was subject to aggression exclude the possibility of a rational preemptive first strike.

To ensure a retaliatory strike after the other side's massive first nuclear strike, it is not just necessary to preserve the launcher; it is essential to provide for the dissemination of launch commands and then to break through the MD system. It should be once again noted that in order to provide for deterrence, it is necessary to demonstrate (without going too far) the ability to take each of these actions.

The amount of nuclear assets (E), required for tenable nuclear deterrence, is determined (according to Trutnev) by three main parameters:

- Aggregate yield of nuclear munitions (NM), which is sufficient for infliction of unacceptable damage (έ);
- Aggregate survivability of the counterstrike forces (ά) to the U.S. strike forces (ά is the share of counterstrike forces that survived the first strike of the adversary); and
- Aggregate survivability of the counterstrike forces (β) to the U.S. missile defense (MD) systems (the share of counterstrike forces that went through all the echelons of missile defense, space defense and air defense systems).

Hence, E= έγ×1⁄A×1⁄β.

If ά = β =1 E= έ, but if ά =1%, β =10%, the aggregate amount of the counterstrike assets E must be 1,000 times larger than έ.

The estimates of the base quantities—έ, ά, and β—include a large number of physical and technical characteristics of nuclear munitions (NM), carriers, adverse factors, conflict scenarios, first-strike forces and MD systems of the United States, their future modification, and so on.

The estimate of έ is determined by the ability to hit hundreds of the main industrial centers on U.S. territory.

Trutnev assumed that 300 nuclear munitions (each with a yield of 0.5 Mt), i.e. έ = 150 Mt, would probably be sufficient in that instance. Trutnev rightly notes that "in fact, this question is more difficult, since the answer to it is given only by the adversary"; the adversary will decide what damage is unacceptable to it in a large-scale conflict, and this will depend on the particular military and political situation (the severity of the crisis, the degree of threat to the main national values, the available alternatives). [44]

Let us once again recall the important role played by the political and psychological characteristics of particular decision-makers and the people around them, including relatives and mates.

The answer to this question may be found, to a limited extent, only in special studies on political psychology, social psychology and decision-making theory.

There may be several types of response strikes, including a deep-response strike,[45] a retaliatory (launch-under-attack) counterstrike, and a counter-assault.[46] Each type of response strike has its advantages and problems. (Major Gen. Vladimir Dvorkin rightly points out that despite the enormous total number of missiles and warheads in the Soviet Union, the deficit of counterstrike munitions capable of surviving a massive counterforce strike by the assailant was quite noticeable for a long time, because the base of the Soviet SNF—its ground-based ICBM task force—remained stationary until 1985. In the West, there was a persistent notion that such weapons were, first of all, designated to deliver a preemptive strike; however, to a great extent, such arms were also designated to deliver a response strike.)[47]

The possibility of delivering a retaliatory launch-under-attack counterstrike and a counter-assault depends to a great extent on the early warning systems (EWS) and on the responsiveness of the SNF command and control system, which depends in turn on the effective maintenance of all the procedures and mechanisms that prevent accidental or unauthorized use of nuclear weapons. (MWS has two echelons. The first echelon consists of satellites that detect the contrails of missiles being launched from sea- and ground-based positions. The second echelon consists of radar systems that are expected to provide credible data on the trajectories of launched missiles. The country's leaders have a maximum of a few minutes to make a decision on delivering a retaliatory launch-under-attack counterstrike or counter-assault.

However, the history of both countries includes a number of situations when the missile warning systems gave false warnings, which required immediate expert verification at the relevant command and control centers.[48] In addition to the aforementioned factors, the ability to deliver a counter-assault requires a highly efficient technical and human intelligence-gathering system. In this respect, the degree of confidence of the country's leaders in the intelligence services must be extremely high, which is a rare thing in world history. A state leader must first of all understand what can and what can't be done by the best intelligence service; consequently, that state leader has no right to assign excessive tasks to the intelligence service.

In order to ensure the ability to deliver a retaliatory counterstrike (counter-assault) while concurrently guaranteeing a high capacity for prevention of accidental or unauthorized use of nuclear weapons, it is necessary to continuously search for an optimum in the course of determining the relevant algorithms that determine the functions of the relevant man-machine system. It is precisely that system that provides for the formulation, adoption and realization of the relevant decision, as well as the necessary controls governing the implementation of that system. It should always be borne in mind that such an optimum is found once and forever. There is a fundamental contradiction between the requirement of responsiveness of the SNF command and control system and the requirement or reliability of locks providing for guaranteed prevention of accidental or unauthorized use of nuclear weapons: the harder it is to open a lock in the command and control system, the longer it takes to issue the commands to use nuclear weapons.

Very important perceptions concerning the problems of the retaliatory counterstrike are presented in the treatises of the most distinguished Russian arms expert, Academician Yuri Trutnev. As part of this concept, writes Trutnev, Soviet leaders would have had to make decisions in several minutes, when they practically did not have "enough information about the actual scale of the first strike of the U.S." (For example, information about the damaged assets and the extent of such damage, the damage inflicted to the population and the MEP,[49] and post-attack surviving munitions).[50] Therefore, from the military point of view, this may result in "politically incorrect and absolutely unbalanced and unjustified actions" like a massive nuclear strike on U.S. cities in response to the first low-yield nuclear or non-nuclear SOA strike on the Russian launch facilities." Trutnev rightly notes that this may "transform a limited conflict into a global collision."[51]

However, the threat of a retaliatory counterstrike and counter-assault is a serious deterrent -against a potential aggressor that contemplates a preemptive decapitation strike. The means providing for such a strike must be developed accordingly. In this context, the missile warning system (as one such means) and its qualitative characteristics play a very important role.

Chapter 4: Challenges of Preventing the Accidental or Unsanctioned Use of Nuclear Weapons

An important prerequisite of strategic stability is the lack of conditions for the unauthorized or accidental use of nuclear weapons.

It is possible to distinguish the following hazards of an involuntary, accidental outbreak of nuclear war: technical errors and failures in the early warning systems and the nuclear weapon control system; ineffectual principles of organization of information-exchange in the decision-making system; human-factor errors in evaluating the strategic situation as a result of interpretation of collected data; and nervous breakdowns on the part of relevant personnel due to potentially inappropriate mental states such as fatigue, disease, or other stressors.

A special hazard is posed by the possibility of collusion among a number of officials who are in a position to take control of permissive-action-link devices of the tactical control system and launch missiles with nuclear warheads autonomously, without the authorization of state leaders and the supreme military command.

Analysis of large-scale accidents in socio-technical systems, such as plane crashes, nuclear power station accidents, and the like, shows that the most dangerous thing is a combination of various types of errors, for example, such as when a merely technical error results in stress and psychological overload. The prevention of an involuntary, accidental outbreak of nuclear war is primarily related to the organization of the decision-making process throughout the entire command and control system of strategic nuclear forces, as well as of tactical and operational nuclear weapons, and the technical facilities that ideally would rule out a cascade of failures within the system.

The problem of guaranteed prevention of involuntary and unauthorized use of nuclear weapons must be tackled purposefully and persistently through, inter alia, extra-departmental control agencies of the country's top leadership.[52] Certain measures could be taken together with Russia's opponents, since this problem seriously concerns politicians, the military and the relevant experts on the other side (there are a number of studies on the matter that are open to the public).

Chapter 5: The Goal of Preventing Escalatory Domination

The problem of securing strategic stability should be considered not just in the context of nuclear-war prevention, but also in the context of the inadmissibility of escalation-driven domination by one side in a severe political and military crisis, especially if the latter may develop into a nuclear conflict.

It should be borne in mind that the United States, on a much larger scale than Russia, has devoted decades to developing a body of theory on the applied aspects of crisis- and conflict-escalation with explicit military components.

One of the milestones in consideration of these problems was the 1965 publication of Herman Kahn's foundational "On Escalation." Kahn worked at the Rand Corporation and later founded the Hudson Institute. "On Escalation" represented the findings of a series of studies he carried out for the U.S. Department of Defense. In this work, experts were primarily intrigued by Kahn's introduction of the concept of the "escalation ladder" in crisis situations. The escalation ladder consisted of 44 "steps" and six "thresholds." The top threshold that followed the 38th step on the ladder was the city-targeting threshold—that is, the commencement of the launching of nuclear strikes on the adversary's cities.[53] These R&D activities formed the basis for the development several decades ago of a system designed to gradually improve the combat readiness of U.S. military forces. In the political and the military stand-offs that occur during international political crisis situations, top U.S. leaders can send valuable signals to their opponents—as well to its allies and the international community as a whole—regarding American intentions by manipulating the degree of U.S. forces' combat readiness.

It is entirely possible that in a certain crisis situation, we may see Washington trying to use the principles and methods that provide for escalatory domination. (Such a perspective in the context of U.S.-Sino relations has been seriously considered by Chinese theoreticians and practical experts over the past 10 to 15 years; this is primarily related to a potential crisis over Taiwan in which China, in order to exercise all its sovereign rights, decides to use military force. Chinese plans regarding the development of that nation's strategic nuclear forces are largely aimed at the prevention of escalatory domination against China. These plans extend as high as the development of a number of tactical and technical characteristics of nuclear missiles, including land-based mobile missile systems like DongFeng 31 and DongFeng 31A. Escalatory domination may primarily rest upon the advantages which the United States has tried to lock in for itself in the areas of strategic nuclear weapons and conventional weapons since the end of the Cold War and the dissolution of the Soviet Union. Attempts to exert such domination may be extremely dangerous in a conflict or crisis situation.

The best way for Russia to block attempts at escalatory domination is by ensuring the availability of thoroughly developed mechanisms for resolving conflicts and crisis situations, based on the national Russian system of crisis management and the adequate military power of Russia. It appears that the importance of the availability of a system of crisis management is belittled by Russian scientists and representatives of the state apparatus and the political class as a whole. This topic is barely covered by Russia's conflict-study disciplines as a politological sub-discipline, due to the lack of any tradition of carrying out serious politological studies with the use of large arrays of empirical data and in-depth case studies.

A crisis is a certain intermediate phase between peace and war, a sort of an in-between gray zone.[54]

According to Stanley Hoffman, during the Cold War, crises to a great extent became a sort of substitute in the context of the "nuclear revolution" of warfare.[55] This formula, which was declared in 1965 soon after the end of the Cuban crisis of October 1962, proved to be correct in the next several decades, at least with respect to the issue of the central war between the Soviet Union and the United States and the two military and political blocs headed by these two powers.

A crisis situation requires a special management mechanism, which is different from the one that is used during the normal, non-critical political processes that characterize peacetime and the one that is used in time of war. This regards both escalation and de-escalation of the crisis. Such a situation requires special concentration and will from the leaders, special mechanisms for the collection, processing and reporting of information to the leadership, special control of the activities of the country's forces, special instructions for ambassadors and military attaches, a special regime of communication with the national and the foreign mass media, and many other things.

Russian developers of managerial solutions tend to focus on the idea of advanced preparation of the management system for wartime, where the principal analogue was the system that was ultimately developed during World War II. That system was all-out and absolute in terms of political goals and the applied forms and means of warfare. This greatly limits the necessary flexibility of the management system, which should be focused on a wide range of conflict and crisis situations that require the use of military force in its various forms. This primarily regards the territories of the former Soviet Union, which are within Russia's range of special and strategic interests.

In the decades after World War II, we had to deal with a great number of limited wars and middle- and low-intensity conflicts without any developed theory of such wars and conflicts, and without a well-developed management system for the political, military, operational or strategic segment. No relevant conclusions have been made yet—either in theoretical or applied parts.

Crisis management mechanisms may exist on a reciprocal basis only if there is an appropriate material component of the military and strategic equilibrium and if the availability of such a material component is proficiently demonstrated on a regular basis. Such demonstrations are a very important constituent of the art of "strategic gesture," a term used by the distinguished military theoretician, historian and political scientist Alexander Svechin.

Such gestures include successful testing of ICBMs and SLBMs, new types of warheads and long-range cruise missiles, and demonstration of the ability of strategic missile submarines to function under especially difficult navigation conditions, which make it difficult for the other side to search, detect and destroy them with its anti-submarine forces.

Combinations of such gestures (based primarily on actual R&D findings) create a polyphonic picture in the eyes of a professional observer. The arsenals of means used for making strategic gestures include demonstration of other technical capabilities by the state, including supercomputers that are required for the reliable and highly efficient functioning of missile warning systems

(MWS), space surveillance systems (SSS), SNF command and control systems and anti-missile defense systems, and for simulation of relevant projects related to the development of new types of nuclear munitions, which is especially important when actual full-scale testing is lacking. New types of nuclear munitions (or modernization of the existing ones) are required for penetration of warheads through the other side's missile defense (MD) systems, which in the modern context becomes a very topical problem for Russia's forces and means of nuclear deterrence.

In the Cold War period, the sides recurrently made (and not always successfully) such strategic gestures as increases in the combat readiness of their military forces (including their nuclear components), the projection of strategic and front-line (tactical) aviation assets that were capable of carrying nuclear weapons, and the displacement of surface warship units (including the ones with nuclear munitions).

The consequences of such gestures were not always sized up by one side or the other, but they were based on the intention to attain a certain political result—either to prevent the crisis or to put an end to it on mutually acceptable conditions. (In a number of instances, one side or the other made serious and quite dangerous mistakes, which must never be forgotten either by the state leadership or by the military command.)[56] Needless to say, in order to provide for consistent activities aimed at the prevention of escalatory domination, it is necessary to have state-of-the-art general-purpose forces as well as relevant conventional arms. Without that, any political and military confrontation between Russia and a serious opponent may jump over to the nuclear level of the escalation ladder.

One should not lose sight of the fact that quite often, such actions were (and are) taken not just to catch the opponent's fancy (and thus influence its behavior), but for domestic consumption too. The latter aspect is definitely underestimated by many political scientists, and all the more so by military experts, particularly in the context of crisis management tasks.

Chapter 6: On Tactical and Operational-Tactical Nuclear Weapons

Intercontinental strategic nuclear weapons (and they were called strategic because of their intercontinental range) dominated and still dominate in most of the strategic stability equations. Tactical (and operational-tactical) weapons were factored out, although in fact, the majority of such weapons were comparable to the warheads deployed on strategic carriers in terms of their yield.[57] Tactical (and operational-tactical) nuclear weapons had dominated as the principal instrument in a potential limited nuclear war. This was especially typical of the type of tactical nuclear weapons designed for use in battlefield warfare; apparently, the most significant type of weapons of this sort were the nuclear warheads held by U.S. and Soviet cannon artillery (for 155 mm and 152 mm howitzers, respectively). The development of this concept of warfare and its introduction to the branches and arms of each side's armed forces was soundly deemed a very dangerous tendency that threatened the very erosion of the borderline between conventional and nuclear war.[58]

Compared to the 1960s and 1970s, the number of tactical (and operational-tactical) nuclear weapons possessed by all official nuclear powers has considerably decreased. However, they are still part of the arsenals and remain an important constituent of the aggregate combat strength of the sides. The role of such warfare is still undetermined. Until the middle of the 1980s, tactical weapons of the U.S. and its allies were deemed as a means of compensation for the imbalance (according to the foreign experts' opinion) of conventional weapons and forces to the good of the Soviet Union and its Warsaw Treaty allies, but nowadays it's the other way around. The role of tactical (and operational-tactical) nuclear weapons in securing the national security of Russia and Russia's allies has increased, but it is not quite customary to speak about that in public.[59]

The role of such weapons is rarely discussed openly by other nuclear powers either, including the United States, not to mention the People's Republic of China. Thus, the authors of the Yearbook of the Stockholm International Peace Research Institute (SIPRI) and the Institute of World Economy and International Relations (IMEMO) of the Russian Academy of Sciences point out that the review of the U.S. nuclear weapons policy and force structure (one of the fundamental open U.S. documents in that field) does not cover non-strategic nuclear weapons. However, the estimated number of such nuclear munitions deployed in the United States amounted to about 500 warheads as of 2007; another 1,155 warheads are part of the reserve.[60]

Traditional delivery vehicles for tactical nuclear weapons were dual-purpose—front-line strike aircraft, medium-range bomber aircraft, artillery, ground-to-ground missiles of the ground forces, air interceptor missiles and fighter-interceptor aircraft of the air defense troops, sea-launched missiles and torpedoes deployed on submarines and surface ships, carrier-launched and land-based aircraft of the Navy.[61] At certain times the number of tactical and operational-tactical nuclear weapons deployed by the Soviet Union and the United States amounted to dozens of thousands.

Chapter 7: Nuclear Deterrence as a Combination of "Vulnerability-Invulnerability"

Interaction in the nuclear area largely rests not just on hardware, but also on nuclear deterrence formulas and concepts. The nuclear deterrence concept has a deep internal contradiction. On the one hand, it is aimed to minimize the likelihood of a war by making it abysmally destructive. For this purpose the state must have the nuclear forces that provide for annihilation of the adversary and infliction of irreparable damage to the enemy even if such a state is exposed to a first nuclear strike. On the other hand, in order to attain deterrence, it is necessary to make the threat of use of nuclear weapons credible and convincing. To this end, it is necessary to make nuclear war less devastating, but at the same time more probable. Such an approach constitutes the basis of the concept of limitation of nuclear war—by the scope of the theater of military operations or by the rules of limited strategic exchange. In order to increase the credibility of the likelihood of the use of nuclear weapons, countries built up the counterforce arms of their strategic nuclear forces (SNF) and developed tactical (and operational-tactical) nuclear weapons. To put it otherwise, as was mentioned above, along with the nuclear retaliation potential, a number of states have been developing real warfare potential, and every new round of such activities, as a rule, was initiated by the United States. And it is true that military-strategic and operational incentives and the scientific-technical capabilities for such capacity building are practically unlimited. And the limitations imposed by the sides to provide for strategic stability in the general interest are primarily the derivatives of political decisions, which are based on serious scientific-technical and operational-strategic expertise.

Many experts believe that in reality there is no contradiction between the two aspects of nuclear deterrence: the better the country's preparedness for war, the wider is the range of tasks that can be fulfilled by its nuclear forces, and the more effective is its capacity to deter the adversary's assault. However, the other side inevitably perceives the measures designed to maximize actual warfighting capacity as proof of aggressive intentions and as an attempt to come out of the blind alley of mutually assured destruction through an opportunity to pursue and win a nuclear war. Obviously, there are considerable psychological (political-psychological) problems related to the acknowledgement of the existence of nuclear stalemate based on the presumption of mutually assured destruction; those problems were perceived by the Soviet Union and the United States in the 1960s and 1970s.[62]

The fear on which nuclear deterrence rests has at least two guises: the fear of nuclear retaliation ("fear-1") and the fear of losing to the other side ("fear-2"). "Fear-2" creates an extremely dangerous and destabilizing atmosphere, if triggered by the threat of the other side's preemptive disarming strike. It is this guise of fear that encourages the arms race and whips up the qualitative improvement of real warfare capacity. However, such steps just invigorate the other side's apprehension that it is dealing with an aggressor. Finally, such fear may play a fatal role in the event of serious aggravation of the crisis situation and may give an impetus to delivery of a preemptive strike.

It should be once again emphasized that the stability of nuclear deterrence increases along with the growth of the confidence of each side that the adversary is not able to deliver a preemptive strike and that one side is able to deliver a retaliatory strike under any conditions. Such a situation is the result of mutual vulnerability and invulnerability. Each of the sides is vulnerable to the extent that a major part of its population and industrial potential may be destroyed by the adversary. At the same time, the strategic forces of each of the sides have a considerable degree of invulnerability, which guarantees the possibility of a retaliatory strike.

Therefore, the situation of nuclear deterrence is a complex combination of "vulnerability-invulnerability." However, this balance is not something hard and fast, either; it may be tilted as the counterforce potential develops. In the modern context, the likelihood of inclusion of high-precision long-range firepower with non-nuclear warheads in the counterforce potential is quite high. This tendency began to take shape in the beginning of the 1980s. The tendency was mentioned by General of the Army and Deputy Minister of Defense of the USSR Vitaly Shabanov.

Chapter 8: A Set of Measures for Ensuring Strategic Stability as an Example of an "Asymmetric Response" to Ronald Reagan's Strategic Defense Initiative

Problems of securing strategic stability were vigorously discussed by the Soviet Union and the United States in the 1980s, which to a large extent was induced by the emergence of the well-known Strategic Defense Initiative (SDI) of U.S. President Ronald Reagan and the problem of medium-range missiles in Europe. At that time, Soviet scientists and experts (primarily as part of the activities of the Velikhov group) formulated the concept for a doctrinal directive regarding specific programs to be deployed as an asymmetric response to the SDI program. The developed concept was eventually adopted by the leadership of the USSR.

This experience is still significant from both the theoretical and the purely applied viewpoints.

The principal difference of the SDI concept from previous attempts to develop a multi-level missile defense system primarily lies in the fact that the particular R&D programs considered by the Pentagon were focused (a) on the space echelon of the missile defense system, and (b) on such exotic means of destruction as various types of lasers, electromagnetic mass drivers, and particle accelerators.

The possibility of using high-power laser radiation to hit various targets was placed on the agenda in the mid-1960s. At that time the Soviet Union, the United States and a number of other countries (especially France) had research programs aimed at development of laser weapons. It was anticipated that such peculiar feature of lasers as the ability to concentrate the beam energy on a small area on the surface of a target could lead to damage or destruction of a non-armored target (first of all, aircraft or missile bodies).[63]

A non-expert would find the SDI concept quite impressive. Reagan had set up a grand task: to rid the United States of the fear of nuclear weapons by rendering them "outmoded and unnecessary"— i.e., to develop a perfect shield against what was called the "Soviet nuclear threat."

The reaction of the major part of the Soviet leadership to the Strategic Defense Initiative put forward by President Reagan was more than negative (and it quite deserved such an attitude).[64] SDI ruined the view of securing strategic stability that had just been formed in the minds of the elderly leaders of the country who poorly digested new information and new developments. The level of technical competence at the top of the state apparatus (except for the Military Industrial Commission of the Council of Ministers of the USSR, part of the State Planning Committee and the Defense Industry Department of the Central Committee of the CPSU, technocrats in the administration of the relevant ministries of the defense industry, and the Office of the Chief of the Armaments Department of the Ministry of Defense of the USSR) was quite low.

It should also be kept in mind that in the 1980s, a number of high-ranking officials in the Reagan Administration remarked that a nuclear war could be won or lost, and the Soviet leadership perceived such statements very seriously.[65]

In the beginning of the 1980s, there were many media leaks in the U.S. concerning various possibilities of U.S.-launched decapitation strikes against the Soviet Union (for several decades the U.S. had been discussing a wide range of ways of waging and winning a nuclear war).[66] The USSR intensified its activities aimed at the development of systems and means of strategic and tactical warning of the adversary's preparations for a massive preemptive strike—both in the military departments and in the KGB, which was headed by Yuri Andropov. A number of principal strategic warning ideas (based on recordings of a set of signs of the principal potential adversary's preparations for a nuclear missile assault) were formulated in the 1970s at the Institute of the U.S. and Canada Studies of the Academy of Sciences of the USSR (here it is necessary to emphasize the role of the alumnus of the Department of Physics of Moscow State University, Doctor of Historical Sciences Andrei Zhukov, who later headed a special department of the First Main Directorate of the KGB of the USSR). In combination with the aforementioned focus of the 1980 platform of the U.S. Republican Party on the attainment of "overall military superiority" by the United States over the Soviet Union, all that looked quite ominous. As in previous years, many state and party leaders and military commanders were instinctively inclined to react with a "spike-against-spike" response and a strategy of symmetric measures (although by that time, more and more people understood that another round of the arms race, with the development and manufacturing of extremely expensive systems based on new physical principles, would be unaffordable for the USSR).

Sen. Malcolm Wallop encouraged the United States to implement a space-based BMD program similar to the Manhattan project, which resulted in creation of the atomic bomb, and to strive for the elimination of the "balance of fear" that was typical of the scenario of mutually assured destruction that had emerged in U.S.-Soviet relations in the strategic nuclear area in the previous decades.[67]

Attempts to bring SDI into line with such large-scale complex technical projects as, for example, the Manhattan project that created the atomic bomb, or the Apollo space program that landed the first human on the moon, were confusing. The principle difference of the SDI program is that it contests not just the laws of nature, which can be understood and remain unchanged, but also a prudent adversary, who can unpredictably use the same laws against the creators of the defense systems, and who forces them to provide for all possible types of countermeasures.[68]

Intuitively, many average Americans had lingering hopes that in the course of implementation of the SDI program there would be a technical miracle that would immediately do away with all the difficulties predicted by numerous critics of the SDI program. This was a shining example of wishful thinking.

Reagan was a well-known Hollywood actor, trade union official and successful governor of California. He unshakably believed in the omnipotence of the American genius, although he himself was an absolute know-nothing regarding technology and the natural sciences. In his understanding of the problems of military-strategic balance and strategic stability, Reagan was far behind not just his predecessors, including Republican President Nixon and Democratic President Jimmy Carter, but also behind Republican President Gerald Ford, whose narrow-mindedness was the subject of many jokes in the American political establishment (as a matter of fact, Ford was not that narrow-minded).

Some smart representatives of the U.S. scientific-technical community convinced Reagan that the task could be accomplished by means of sufficiently large investments and concentrations of effort by U.S. scientists and engineers. Reagan had strongly believed in that that notion until such time as it proved to be false in practice.

The distinguished Hungarian-born American physicist Edward Teller, father of the hydrogen bomb, at one point managed to convince Reagan that one of his brainchildren—the nuclear-powered X-ray laser—could radically change the technological basis of the anti-missile defense system. Teller speculated that, judging from openly available publications, Soviet scientists for many years had been far ahead of U.S. scientists in X-ray laser development. (Teller emphasized that such materials had not been published in the USSR since 1977.)[69]

It should be noted that right after Reagan put forward the Strategic Defense Initiative, it was opposed by many distinguished U.S. scientists, including those who had been involved in the development of the U.S. thermonuclear weapons program along with Teller. The American scientists (in particular, the Federation of American Scientists, the United States National Academy of Sciences, the Union of Concerned Scientists, and the Congressional Office of Technology Assessment) carried out a large number of serious research activities dedicated to the problems of anti-missile defense and strategic nuclear weapons. The research included a large number of calculations and technical details, which in turn were actively discussed at public and closed sessions of the special-purpose committees of both chambers of the U.S. Congress.

Such a distinguished representative of the American national security establishment as Paul Nitze constantly insisted that the missile defense system must meet the cost-effectiveness criterion (as mentioned above, this criterion was first introduced in the public administration practice by Robert McNamara). In other words, the system should be cheaper than the offensive weapons it was designed to neutralize. Originally, Nitze raised the issue of missile defense in that context back in the 1960s, during the first great missile debates. At that time, the so-called "Nitze Criteria" were formulated and adopted by the majority of Washington politicians, technocrats and bureaucrats.[70] In 1985, the Nitze Criteria were formalized in National Security Decision Directive #172, and their adoption played an important role in the destiny of the SDI program.

Teller and lobbyists of other technologies for combat space stations ultimately failed to prove that the systems based on such technologies would meet the Nitze Criteria.

History shows that in most cases, including Russia, the reaction to the threat was symmetric,[71] which was more convenient both psychologically and intellectually. Search for asymmetric response-actions always requires greater intellectual strain, deeper and broader professional knowledge, and more creativity. Symmetric reaction to the emerging challenge and threat is better and more naturally perceived by the overwhelming majority of the people. Distinguished military strategists, of course, searched for possible asymmetric responses either empirically or, which is even better, theoretically.

One of the most prominent theoreticians and practical experts of asymmetric actions, ancient Chinese warlord and military strategist Sun Tzu (600–500 B.C.), stated that it was important to win without fighting and that it was necessary to engage in a battle only if it came to a pinch. In his treatise on the art of war, a careful reader would find a number of unorthodox stratagems, which are useful not just in the military arts, but in the vital activities of life as a whole.

If we recall Sun Tzu's ideas of asymmetric response to threats, we will see that he taught that it was necessary to act not as the adversary wanted you to act, and not as the adversary acted itself, but rather that it was necessary to find options that would maximize your strengths and minimize the adversary's capabilities. Brilliant examples of development of asymmetric strategies can be found in the treatises of a distinguished Russian theoretician and military historian of the first half of the 20th century, Alexander Svechin.[72]

In summarizing the outcomes of the enormous work done in the Soviet Union in the 1980s to develop the concepts and programs of asymmetric response to SDI, it is necessary to highlight three main types of response to the U.S. potential large-scale missile defense system:

1. Enhancement of the combat stability and invulnerability of strategic nuclear forces. (This entails the improvement of the explosion-resistance of silo launchers and ICBM launch-control centers; the enhancement of the stealth capabilities of land-based mobile missile systems; the quieting of nuclear submarines; the enhancement of the means of protecting strategic submarines from the other side's anti-submarine forces; and the protection of ICBM launching sites with local missile defense facilities.)

2. Improvement of the capability of Russia's offensive strategic nuclear forces (SNF) to penetrate all possible missile defense echelons, or belts, of the adversary (including essential reduction of time spent at the boost stage, where missiles are most vulnerable);[73] and enhancement of the maneuverability of warheads at the fly-in stage, with a reduction in the risk of their destruction.

3. Development of special measures to hit and neutralize combat space stations (SCS) or near-Earth relay mirrors of powerful ground-based laser devices.[74]

Not all of those measures were implemented as R&D results at that time. Rather, the pace and scale of their implementation was interlinked with the pace and scale of implementation of the SDI programs.

By type of impact, such countermeasures may be active or passive. By time of activation, such measures can be classified as fast-response measures, which are directly linked to the time of the response strike; or as long-term measures for the timely preparation of a potential response-strike, including quantitative and qualitative structural changes in nuclear deterrence means and forces. The system of measures also stipulated certain local measures that could be taken for hitting vital and quite vulnerable elements of the adversary's multi-echelon missile defense systems—especially the space echelons of the missile defense system, which, in particular, included a space-communications system that could be disabled; a control system where the central controller computers were the most vulnerable links that could be deployed in limited numbers (even if duplicated) due to their complexity and high cost; and various energy sources and energy systems, such as nuclear power units, explosives, and flammables.[75]

We have linked consideration of the problems concerning the R&D in the SDI programs with ongoing developments in the strategic U.S. offensive-weapons program of the 1980s. Beginning in the 1980s, the United States commenced a qualitative reorganization of its strategic forces, which primarily resulted in the capability of the U.S. naval component of the triad (which was traditionally considerably bigger than the same component of the Soviet strategic forces) to deliver surprise strikes against hardened targets. In addition to means of destruction of high-priority hardened targets like ICBM launch silos of the Soviet Strategic Missile Forces (SMF), the development of U.S. military capacity stipulated (in the event of implementation of recently projected programs) a large number of means of target destruction, which (although hardened) had a limited capability of avoiding such strikes; in particular, that was the designated purpose of the aircraft component of the triad.[76]

In-depth scientific contemplation of the ecological, climatic, biomedical and other various consequences of nuclear war constituted an important part of the great debates of the 1980s on the problems of SDI and strategic stability as a whole. This certainly contributed to a better understanding by the political and military elites on both sides of the entirety of the catastrophic consequences of using nuclear weapons—especially if such weapons are ever used on a massive scale. In the modern context of the 2000s, it is necessary to bear in mind that the perception of the threat of annihilation of our civilization, and the very real possibility of the Earth being destroyed as a result of a nuclear exchange, has considerably waned. This is illustrated in particular by the mutual military and political rhetoric of the elites of Pakistan and India in the course of one of the sharp crises in their relations after they acquired their own nuclear weapons.

Chapter 9: Latest Trends in the Development on Nonnuclear Weaponry, the Forms and Methods of Conventional Combat and their Impact on Strategic Stability

In the 1980s, experts from the Soviet Union, the United States and member states of the Warsaw Pact Organization and NATO actively discussed the aspects of securing strategic stability with respect to conventional weapons and conventional armed forces in Europe.[77] An important role in those discussions was played not just by the U.S. and Soviet experts, but also by experts from Germany, the Netherlands, Poland and Hungary. By no means unimportant were the discussions regarding various formulas of "non-offensive defense" and "non-provocative defense." Such discussions resulted in the development of formulas of limitation and reduction of conventional arms, as well as new doctrinal tenets.

The issues of limitation of the sides' offensive capabilities and limitation of the types of peacetime military activities that increase the capability of large-scale warfare with the use of general-purpose means and forces and conventional arms remain quite topical today.[78] Certainly, in this respect it is necessary to take full account of the latest trends in development of the art of war that are taking shape as a result of what is called the "revolution in the military arts."[79] In addition, it is necessary to take into account the sharply increased role of information and communications technologies, network-centric warfare, new electronic warfare capabilities, and robotization of striking and auxiliary assets (the growing roles of unmanned reconnaissance-strike complexes, as well as strategic, operational and tactical-mobility assets, are all shining examples).[80]

A more and more important role in ensuring efficient warfare is played by supercomputers, defined as computers that have a processing speed of more than 1 teraflop, which means they can perform more than 1 trillion floating-point operations per second. In this same category are the networks of such computers; the warfare models that are simulated using such computers; and the generation of logistic and decision-making models (including those developed with the use of artificial intelligence technologies), both at the operational strategic and political-military levels. All these means serve as a powerful multiplier of combat capabilities. (Within the next 3 to 5 years, the command and control systems of the most developed countries will be equipped with 1-petaflop supercomputers that can perform 1 thousand-trillion floating-point operations per second.)

We have witnessed the transformation of electronic warfare from an auxiliary, supporting capacity to one of the principal combat tools (unfortunately, the Russian Armed Forces have yet to fully realize this fact). Moreover, electronic warfare no longer means just electronic countermeasures (ECM); it is becoming a more sophisticated confrontation instrument, both in peacetime and in time of war, which requires high intellect and professionalism.[81]

The in-depth study of the medium-term, long-term and very-long-term trends in the development of the military arts shows that strategic, operational, and tactical mobility is becoming a prevailing principle of warfare. Mobility in the real actions of the armed forces of different countries is a more important factor than any concentration of military power at the main point of attack; in a number of instances, it even substitutes for the latter.

Mobility, in combination with the uniform data field, and the relevant operational and combat training and equipment of soldiers and battle groups, makes it possible to conduct multifocal combat operations in dispersed battle arrays and thus defocus the adversary's attention. All types of mobility are extremely important for Russia, with its immense territory and various conditions for fulfillment of the military mission and conduct of combat operations by the armed forces. Unfortunately, this importance is not adequately perceived even by the Russian expert community. In a present-day war, with multifocal combat operations and no solid front lines, we are noticing an increase in the share of special assets and forces, which take over a number of tasks that used to be intrinsic to the ground forces.

In the context of the qualitatively new stage of development of aerospace assault weapons, which potentially may be used against Russia, it becomes especially important to develop new approaches toward the assets and systems of air defense, missile defense and space defense at all levels (strategic, operational and tactical), and to set realistic tasks for these systems with due regard for particular theaters, types of military operations, and various scenarios of aggravation of the political-military situation. Again, the role of electronic warfare in this context should become more and more important.[82]

In the past, the strategic air defense forces and, to a lesser extent, the space and missile defense forces that were extensively developed in the Soviet Union were predominantly stationary, and their mobility capabilities were minimal. Today, Russia needs to develop these forces by focusing on their mobility—not just tactically, but in the operational and strategic spheres as well. The new tactical and technical requirements and tasks concerning the development of new components and the modernization of existing ones must be formulated with this goal in mind. In this context, the means of mobility, which in particular provide for the quick long-distance delivery of air-defense missile systems (ADMS), and also include heavy cargo aircraft like the An-124 and the relevant airfield and information infrastructure, will become increasingly important.

In all, it is necessary to state that in the modern context, the parameters of evaluation of the balance of forces and the conditions of strategic stability of general-purpose forces have become more complex, multidimensional and multivariate. Today, evaluations of the actual combat strength of the sides, of the balance of forces, and of the conditions for securing strategic stability, should be based to an even lesser extent on calculations of the number of strike aircraft, tanks, armored combat vehicles (ACV), artillery pieces and helicopters than was the case in the recent past.

However, as was the case during previous revolutions in the military arts, all the latest military hardware can be found alongside traditional, prerevolutionary hardware, albeit of the more technologically advanced variety, such as tanks, other ACVs, aircraft carriers and additional systems. Some combat platforms are used in a new way. Certainly, all these aspects should be reflected in the new provisions of the military doctrine of the Russian Federation, set down in its field manuals and instructions, and clarified in Russia's programs and plans of development of weaponry and military hardware.

One of the topmost characteristics of nuclear weapons is their non-selectivity. Any discussion of the technical aspects of this issue should note that the development of nuclear weapons in all the decades after World War II has been characterized by an intent to shun that non-selectivity. All nuclear warheads and delivery vehicles—tactical, operational-tactical and strategic—were developed with this idea in mind. The principal trend has consistently been in the direction of reducing yields and enhancing the accuracy of warheads, including warheads that can destroy hardened targets without any considerable side effects. Alongside this trend, experts have been developing various concepts of limited nuclear war and different controlled nuclear conflicts. The intention to shun such non-selectivity largely explains the post-nuclear revolution in military arts (RMA).

Breakthroughs in information technologies made it possible to detect the adversary and selectively destroy it using high-precision weapons with non-nuclear warheads. Meanwhile, combat platforms—ships and aircraft—may be operating hundreds or even thousands of kilometers away from the battlefield. A constellation of parameters of the present-day RMA is largely characterized by the return to selectivity in the use of forces and weapons, which certainly does not mean the complete neutralization of what is called collateral damage in the West. At the same time, one of the features of the present-day RMA is the intention to maximize the protection of one's own forces while reducing one's own losses and casualties.

All this is backed by a huge multilayered and multidimensional complex of support facilities combined into sophisticated technical and man-machine systems of reconnaissance, target designation, real-time data processing, and navigation. A modern commander or operator must be deeply familiar with these complex facilities and their capabilities and weaknesses. The revolution in the military arts places certain demands upon the organizational systems of the military services, including certain types or branches of the armed forces and the inter-branch structure as well.

The integrity and consolidation of all the linked forces and assets have become one of the keys to success; now there is a growing tendency to secure such integrity at the tactical level, i.e., at the level of brigades and battalions.

Chapter 10: Challenges of Non-Proliferation of Nuclear Weapons, Delivery Vehicles and Fissile Materials

In the modern context, the problem of achieving non-proliferation objectives with respect to nuclear weapons, to their delivery vehicles,[83] and to the fissile materials that are produced in large quantities, has moved to the forefront of global politics as they pertain to strategic stability.

There is a real threat that nuclear weapons and fissile materials may fall into the hands of extremists. And here, the situation in Pakistan (which, according to a number of authoritative estimates, has drastically increased its nuclear potential) is a matter of special concern to the international community. The consequences of a terrorist group using just one nuclear warhead are equitably deemed as catastrophic, both for the victims of such mega-terror and for the entire global political system as a whole. This threat is still underestimated by a considerable part of the political elites in many countries. At a time when civilian use of nuclear power is on the rise in many parts of the world, the international community is nevertheless failing to harden its nuclear-security measures, which is making it all the easier for a terrorist group to illicitly acquire fissile materials that could be used in the production of a nuclear bombs.[84]

The importance of this problem is reflected in the 2005 International Convention for the Suppression of Acts of Nuclear Terrorism. This is the first anti-terrorist convention developed by the international community to prevent terrorist use of nuclear materials and other radioactive substances. The Convention first of all defines radioactive and nuclear activities (pp. 1–2 of Article 1). It specifies nuclear objects in detail. And these are not just the nuclear reactors used at nuclear power stations, but also the nuclear reactors deployed in various transport modalities, including sea vessels, aircraft and space-based systems) as a source of energy (pp. 3a of Article 1). Thus, the list of nuclear objects subject to protection has been considerably expanded.

In conformity with this document, the signatories agree that any unlawful or intentional possession and use of a radioactive material or a device containing radioactive substances with intent to cause death or serious bodily injury, substantial damage to property or to the environment shall be deemed a criminal offense on the part of any natural or legal person, international organization, or state (pp. 1a, b of Article 2).

Acquisition of nuclear-power status by new states may drastically complicate and perplex the entire system that currently provides for the securing of regional and global strategic stability. This perspective is absolutely realistic these days, notwithstanding the efforts of the international community. For example, acquisition of nuclear-missile weapons by Iran[85] would create a very complex inter-regional, sub-global nuclear configuration—a sort of a hexagon formed by the nations of China, India, Pakistan, Russia, Iran and Israel;[86] in this context, the interactions among the elements of the hexagon will definitely be influenced by the central nuclear balance between Russia and the United States that is the successor to the USSR-U.S. balance. (In this respect, there is a high probability that Iran will be quickly followed by Saudi Arabia, which will become a nuclear power by virtue of its long-term deep relations with Pakistan.[87] Thus, the hexagon may turn into a heptagon in the near future). In view of the development of nuclear-missile weapons by North Korea and the nuclear status of China, a complex polygonal nuclear configuration may also emerge in the Far East, especially if Japan acquires nuclear weapons.

It is necessary to take into account the motives and conditions pertaining to the acquisition of nuclear weapons by any country. Summarizing the history of the emergence of new nuclear powers, we can distinguish at least three motives:

> 1) Status—this is the principal motive in most cases (which is proved by conversations with Indian, Pakistani and Iranian experts);
>
> 2) Aspirations to compensate for general military and political uncertainty (as happens, for example, when nations lose faith in their military and political allies or lack trust in their ability to risk their own security for the sake of the security of an ally that has no nuclear weapons (for example, France's perception of the unreliability of the U.S. nuclear umbrella, as well as the same disbelief of Japan in the modern context); and
>
> 3) Aspirations to compensate for a large imbalance in conventional forces in the face of potential adversaries. (Consider Israel's perception of certain Arab states who reacted to the force-based emergence of Israel in one of the most populated areas in the world with slogans of total war ["Throw off Israel into the Mediterranean Sea"]). In this instance, the expression of such aspirations is taking place along a path that could lead the execution of military, operational and strategic tasks; moreover, nuclear weapons are deemed as a multiplier of combat capabilities on the battlefield.

The necessary prerequisites for the acquisition of nuclear weapons include a consensus of opinion within the ruling elite and a sustainable group of technocrats who have been dealing with the problems of nuclear weapons and the use of nuclear energy for peaceful purposes for several decades.

It should be remembered that once nuclear weapons emerge, their development continues; this is the time for new rationales, new tasks, new means of destruction, new operational-strategic capabilities, and new political ideas concerning the role of nuclear weapons.

The formulas for securing strategic stability in polygonal nuclear configurations have not yet been developed. Even theoretical ideas of that kind are in short supply. Given such a configuration, the prevention of nuclear conflict will be accidental without the relevant intellectual, political and defense efforts.

The experience in development of the U.S.-Soviet dyad system of mutual nuclear deterrence, which is to a certain extent applicable to the interaction of such relatively new nuclear powers as India and Pakistan (which acquired nuclear weapons in 1998), would be of meager value in the context of the relationship among the pinnacles of this hexagon.[88] The equalization of relations between the hexagon's pinnacles cannot resolve itself into the sum of relations within the dyads that form the basis of the hexagonal structure. Neither can the equation of the nuclear triangle of the USSR, the United States and China that was prevalent from the 1960s through the 1980s serve as an analogue, due to the obvious smallness of China's nuclear arsenal compared to the nuclear forces of the two nuclear superpowers.

Similarly, it is still quite difficult to evaluate the parameters in the China-India-Pakistan triangle that began to take shape at the end of the last decade.

India set off its first peaceful nuclear explosion in 1974. After that, it set off a series of explosions of a number of warheads that could be delivered to targets on the territory of Pakistan and China. In 1995, India's Rao government was going to carry out a series of nuclear tests, but changed its mind under pressure from the international community.[89] India's nuclear explosions in 1998 were filliped by Pakistan's testing of its Ghauri medium-range missile, which has a range of 1,500 km; this missile could hit 26 Indian large cities and the major part of nuclear facilities in India. Sergei Oborotov writes that "Ghauri with a nuclear warhead evoked the long-forgotten feeling of vulnerability to Pakistan among Indians."[90] Later, Brajesh Mishra, national security advisor to India's Prime Minister Vajpayee, recalled: "We had to show a credible deterrent capability not only to the outside world, but to our own people."[91]

In the late 1980s, India was already sure that Pakistan had nuclear weapons, and thought that Pakistan had acquired those weapons with the active assistance of China and the connivance of the United States.[92] At that time, with Rajiv Gandhi's government in power, India accelerated the implementation of its military nuclear and missile programs; at the same time, Rajiv Gandhi presented his gradual global nuclear disarmament plan to the UN.[93]

Today, the only perceivable way to study the problem of securing strategic stability in the polygonal nuclear configurations is the consistent contemplation of the dyad relationship, with an analysis of their perception by the other nuclear actors in the hexagon (or the heptagon). The following step is a contemplation of the relations within the triangle with a subsequent transition to the quadrangle and to succeeding structures.

We may assume with a high degree of confidence that every time a state's leaders, political elites and military commanders begin to digest the main strategic stability principles related to understanding the entirety of the consequences of the use of nuclear weapons—including the degree to which it is possible to control military actions when the use of nuclear warheads is implied—that they do so from the outset.

The case of India and Pakistan showed that the experience of two nuclear superpowers who at some point had gotten over a series of extremely dangerous crises that could have resulted in the use of nuclear weapons, was difficult to learn. (In general, most politicians are not able to learn from others' experiences and mistakes.)

The 1999 Kargil conflict convincingly proved the inconsistency of the theoretical and rather hypothetical assumptions of those who believed that possession of nuclear weapons by two antagonists increases their temperance in using military force long before they reach nuclear threshold. Over the course of the Kargil conflict, India had to use up to ten divisions of its ground forces supported by strike aircraft. It had to deal with about 1,000 mujahedeen who found their way from the territory of Pakistan to the Kargil sector in the northern part of the Indian states of Jammu and Kashmir. The invaders included representatives of Pakistan's regular armed forces. Indian troops had to fight with Mujahedeen troops in extreme mountain conditions, where artillery, armored vehicles and even aviation, as a rule, did not provide any decisive advantage.

In the course of the conflict, all the armed forces of the two sides were on the alert. The fighting in the region lasted for more than two and a half months and. As Vladimir Sotnikov rightly notes, it was actually a "large military confrontation between the two long-standing geopolitical adversaries."[94]

In 2001 and the first half of 2002, India and Pakistan repeatedly approached the nuclear threshold. In that respect, the terrorist attack on the Indian Parliament in December 2001 was a very strong impetus. It happened notwithstanding the fact that both countries were at that time part of the antiterrorist coalition led by the United States. In a number of instances, both sides urged the use of nuclear weapons.

A nuclear exchange between India and Pakistan could have ramifications even beyond the deaths of millions of people in South Asia, which would be a very serious shock to all mankind, including Russia. With a high degree of probability, this would result in heavy radiological fallout on the territory of Russia and other countries of the former Soviet Union, with severe after-effects on people's lives, the environment, and agriculture.

The evaluation of the possible ecological and climatic consequences of a use of nuclear weapons by India and Pakistan against each other should be based on the assumption that, as prominent Russian expert Alexander Ginsburg notes, they would be considerably different from large-scale atmospheric changes and subsequent ecological disasters, which had been studied in the 1980s as part of the analysis of the nuclear-winter phenomenon. These differences result from the mountainous terrain and high density of the population in the region of possible use of nuclear weapons by both sides. Meanwhile, the aggregate yield of the nuclear warheads possessed by both sides is relatively low, compared to that of the former USSR and the United States historically, and that of the Russian Federation and the United States today. According to the estimates of Ginsburg, the aggregate TNT-equivalent yield would be about 1 megaton. As the author concludes, despite the peculiarities of the situation in the region, "it may be convincingly assumed that local and regional atmospheric and environmental effects may be much more detrimental to the life of the population and the demographic situation in the region than the direct damage caused by nuclear explosions."

No experts doubt that in the past 10 to 12 years, Iran has established a technological basis for creating both civilian and military missiles. Many experts have long ago noticed that the series of medium-range missile tests conducted by Iran could make military and strategic sense only if such missiles were equipped with weapons of mass destruction (WMD), primarily with nuclear warheads.

There is no sense in equipping ballistic missiles of that class with conventional warheads—the ratio between the cost of a destroyed target and the cost of the missile itself would be very low. The availability of such missiles without nuclear warheads in the military arsenal would have zero effect from a political point of view, and would hardly strengthen the country's status. And it should be once again emphasized that in many instances, status can play a decisive role in the acquisition of nuclear weapons and their delivery vehicles by a particular country.

A much more realistic scenario implies the acquisition of nuclear weapons by radical political forces using terrorism as an instrument for struggle (which is a more correct term than "terrorists"), as a result of a sharp de-stabilization of the domestic political situation in a particular country and the destruction of its strategic management system, including the special system of control of nuclear weapons.

Such concerns have lately been voiced most frequently with regard to Pakistan.

At the same time, a transfer of nuclear weapons and their delivery vehicles to a terrorist organization by a particular country should not be completely ruled out. Such a decision may be primarily related to at least two circumstances: first, an extraordinary situation within the government of a country that has nuclear weapons; and second, an instance of close cooperation between a radical non-state organization that is ready to use nuclear weapons, and the authorities of a country that has nuclear weapons, whereby the power and the influence of such an organization must be at least comparable to the power and the influence of the state apparatus of the country that possesses the nuclear weapons.

In such an extraordinary situation, the country that has the nuclear weapons may mean to threaten the outside forces' nuclear strikes on its own nuclear facilities. If such a threat is perceived as real, it is possible to assume that an actor who is afraid of losing possession of nuclear weapons may decide to disperse those weapons by transferring them to the terrorists, who are ready to use them on the territory of the country that is planning to deliver a preemptive strike against its nuclear facilities.

Analyzing the latter circumstance, we can recall a number of precedents in history when secret terrorist organizations had close relations with the official state authorities of certain countries.

For example, in 1914, on the eve of World War I, the terrorist attack of student Gavrilo Princip on Austro-Hungarian Archduke Ferdinand in Serbia, which triggered the war, was the result of activities of radical organizations that used terrorist methods and had well-established roots in the Serbian General Staff.

Chapter 11: Selected Observations on the "Dyad" Relationship between the Russian Federation and the United States

Despite the worsening of U.S.-Russia relations in recent years caused by the policy of the Republican Administration of George W. Bush, these relations did not escalate into a new Cold War, and the general background for securing strategic stability became more auspicious than it had been for the greater part of the second half of the 20th century. However, from the material point of view, a number of parameters related to the securing of strategic stability look much worse today than they did in the past.

It is possible to highlight the following circumstances that have an adverse effect on the perspectives of securing of strategic stability.

In 2002, the Bush administration unilaterally withdrew from the 1972 ABM Treaty between the United States and the Soviet Union, which had been of indefinite duration. That was a heavy, probably irreparable blow to the strategic stability of the dyad structure and of global stability as a whole. In the 1990s, the Clinton administration carried on negotiations with Russia to define the distinction between strategic and non-strategic missile defense, with the aim of modifying the 1972 ABM Treaty. Let us recall that the ABM Treaty imposed serious limitations on the deployment in outer space of attack weapons that could be used for both missile defense and anti-satellite purposes. At present, there are no legal or contractual limitations on the deployment of strike weapons in outer space, except for the deployment of nuclear weapons in space. Development of a national missile defense system became one of the principal issues of the Bush administration. As distinguished Harvard professor and U.S. political scientist Graham Allison has said, the development of a missile defense system had become a matter of faith for the Bush administration, but not a matter of policy or military strategy. In the last few years, Congressional Republicans led by the late Jesse Helms, who chaired the Senate Foreign Relations Committee, stated that the 1972 U.S.-Soviet ABM Treaty had lost its legal force after the dissolution of the USSR, and therefore refused to ratify the 1997 ABM-TMD Demarcation Protocols. We should not expect the emergence of a similar document, given that President Barack Obama has given his formal assurances to the U.S. Congress that there would be no constraints on U.S. missile defense.[95]

Meanwhile, the ABM factor is becoming an increasingly weighty issue alongside the achievement of reductions in the parties' nuclear arsenals, warhead stockpiles and delivery vehicles. This was recurrently sized up in Russia through a series of computer simulations in the 1980s and 1990s. The ABM factor may be neutralized only by enhancing the combat stability of Russia's strategic nuclear forces (SNF), improving their invulnerability by concealing the bases where they are located, and increasing their ability to break through missile defense systems. All these activities are expensive, and sometimes very expensive. Pursuit of the optimal profile of Russia's SNF based on the "cost-efficiency-attainability" criterion is a very important task that requires various methods of system analysis and operational research, including mathematical computer simulation and supercomputer simulation.

Having considerably greater economic and scientific-technical capabilities than Russia, the United States was able, over the past 15 to 18 years, to afford more large-scale measures to maintain the combat readiness of all three components of its strategic nuclear forces, and to provide for their modernization, which could not but tell on the actual balance of forces in its dyad structure.[96] In addition, the United States has expended considerable effort on enhance the counterforce potential of the its SNF—i.e., its ability to deliver a preemptive, disarming strike on the SNF of any other country. As mentioned above, this may be deemed as one of the means of securing escalatory domination in the event of a grave international crisis.

After George W. Bush came to power, deviations from the principles of strategic stability began to become obvious. This was also demonstrated by the Strategic Offensive Reductions Treaty (SORT) of 24 May 2002;[97] withdrawal from the ABM Treaty was one of the most illustrative examples. There was a strong political and ideological motive behind that, as well as an intention by the Bush administration to gain a footing as the world's only superpower, and to deprive Russia of this status, even in the nuclear sphere.

Chapter 12: The Role of Other Nuclear Powers, Which Are Also Members of the UN Security Council, in Defining the Formula for Strategic Stability

The Soviet Union had recurrently brought up the issue of engagement of other nuclear powers in the process of limitation and reduction of offensive weapons. In these latter days Russia has been reasonably emphasizing the need to encourage other countries to join the U.S.-Soviet Intermediate-Range Nuclear Forces Treaty (INF).

It should be noted that such countries as China, France, Great Britain and India actively continue to modernize their nuclear forces and assets enhancing their warheads and their delivery vehicles.

The estimated number of China's silo-based ICBMs (DongFeng 5A missiles, deployed since 1981) is 20 single-warhead missiles with 4–5 megaton warheads as of 2008.[98]It is assumed that these ICBMs may be reequipped with lighter 3 warheads with false targets for breaking through the other side's missile defense system. The estimated number of deployed land-based mobile missile systems DongFeng 31 and DongFeng 31A (intercontinental range) is 12 pieces.

China for quite a while had faced serious problems with development of the naval component of its strategic nuclear forces—submarines with long-range ballistic missiles. According to expert estimates, China is 18–20 years behind the United States, Russia, Great Britain and France in that kind of technologies. It is assumed that China has only one submarine of that kind and two more are under construction. China's MRBMs may be considered as means of deterrence of the United States and their allies in the Asia-Pacific region and measures to countervail the nuclear arsenal of India and certain part of the nuclear arsenal of Russia.[99]

China's nuclear arsenal has not considerably changed in size for many years. In February 2006 the Director of the U.S. Defense Intelligence Agency reiterated the estimate made by various U.S. government agencies since the middle of the 1990s: Beijing had more than 100 active nuclear warheads deployed on ballistic missiles. Additional munitions constitute the reserve[100]. According to the estimates of a number of non-governmental analysts, China's combat-ready arsenal does not exceed 80 warheads.[101]

China was the first country to declare the principle of non-use of nuclear weapons and had remained the only state that followed that principle until the Soviet Union joined it. Today China again is the only state, which adheres to this principle in absolute terms. Along with its obligation not to use nuclear weapons, China undertook (without any preconditions) not to use or threaten to use nuclear weapons against non-nuclear-weapon states or nuclear-weapon-free zones.

In conformity with the 2004 National Defense White Paper, China "rests on the principles of self-defensive counterstrike and limited development of nuclear forces and strives to build streamlined and efficient nuclear forces" with an obligation not to engage in a nuclear arms race with any other country.[102] The white paper also emphasizes that China "always pursues a policy of no first use of nuclear weapons in all circumstances and at any time."[103]

China is gradually moving to the position of the world's second superpower. Relatively soon China's leaders will have to take very serious decisions concerning its strategic nuclear forces. The volume of China's GDP, dynamics of its economic development and the number of the country's population have already become a weighty political and military factor of the world development; in addition to that, China has made considerable progress in development of its general-purpose forces. It is possible to note that during this decade China has been still very cautious and accurate in building up its strategic nuclear capability, rather choosing to develop its general-purpose assets and forces within the group that is primarily focused on Taiwan.

While developing plans and carrying out activities in the political-military and military-strategic spheres, China has to more and more come out of the shadow of the still remaining U.S.-Russian central strategic cooperation that was developed based on the cooperation between two superpowers—the Soviet Union and the United States.

Thereby development of the missile defense system in the United States has more and more relation to China. Due to their small size, China's strategic nuclear forces (SNF) are more sensitive to the ABM factor than Russia's SNF, which, despite the considerable reduction of the number of carriers and warheads with delivery vehicles, are still comparable to the U.S. SNF. China will apparently have to start building its own missile warning system (MWS), which it practically has not had for a long time, at least in the form that is comparable to the MWS of the United States and Russia. As to missile defense, the situation is much more complicated. The most complicated aspect of missile defense systems is the system integration of strike, information and command components into a single functioning complex, as well as solution of a number of intricate scientific-technical problems related to separate components of the system—radar stations, anti-missiles of various ranges, and computer complexes, including software—which were already mentioned above, when we talked about development of the missile defense systems in the USSR (Russian Federation) and the United States. Thus, technically China is more prepared for a breakthrough in deployment of its strategic offensive forces than for development of its ballistic missile defense (BMD) system. (It should be recalled that even such technically advanced countries as France and Great Britain at their time decided not to further their work on development of their missile defense systems. Neither France, nor Great Britain had developed their own MWS either.)

India, which is breathing down China's neck, is currently in a stronger position than China from a political and political-military point of view, because the United States and its allies practically do not see India as a state that is able to throw a challenge to currently the only superpower. Moreover, Washington recurrently tries to use India as a counterpoise to China (and to a certain extent to Russia).

In order to keep India as a great power, which plays nearly a primary role in securing the Asia-Pacific and the global balance of forces that is needful for the United States, Washington has agreed to unprecedented U.S.-India relations in the area of civil nuclear-power engineering, which are at variance with the previously declared principles of the U.S. policy in the area of non-proliferation of nuclear weapons.[104]

The most probable line of conduct of China's leadership in the coming several years will be demonstration of technical capabilities to break through the U.S. perspective missile defense systems and enhancement of combat stability of its SNF group (including its transition from the ICBM monad to the ICBM-SLBM dyad). In doing so China's leadership will probably carefully monitor the implementation of plans of development of all types of missile defense systems—on the territory of the United States and the missile defense system in a theater of military operations.[105]

One of the crucial moments for China's leadership may be the U.S. decision on development of a missile defense system with nuclear interceptors equipped with new types of munitions that may increase the power of the U.S. missile defense system several times, which has been increasingly discussed in the U.S. professional scientific and military political publications in these latter days. There are many factors telling that the resuming of full-scale nuclear testing that is currently being discussed in the United States is aimed to attain this very task, i.e. development of nuclear warheads with minimal side effects, first of all, with minimal energy output in electromagnetic impulse (which can inflict serious damage to own objects, both civilian and military, including radar stations and other means of detection, guidance and target designation of own missile defense system; this was found out by the Soviet and the U.S. scientists back at the end of the 1960s and at the beginning of the 1970s). Therefore, the likelihood of not only virtual, but actual zeroing of China's strategic nuclear capability in that instance would considerably increase.

Great Britain had placed stake on closest cooperation with the United States at the time of WWII and on maximum reliance on the U.S. MWS. The groundwork laid during the war allowed the British to develop their own nuclear weapons very soon, even though they joined the nuclear club three years later than the USSR. Great Britain long ago abandoned its air component of the SNF and since it (unlike France) never had its own ground component (except for a short period of time when it formally received the U.S. MRBMs deployed on the islands), today the British strategic forces are represented by the naval monad. Great Britain practically abandoned its tactical nuclear weapons too, having removed WE-177-type air bombs from operational status (designated for Tornado and Sea Harrier aircraft and helicopters) in 1998 (10 years earlier than was initially planned). The choice of the naval component of the SNF by the former "mistress of the seas," which preserved the high level of naval culture and high quality of its nowadays relatively small British Royal Navy, is generally explicable.

The UK nuclear forces have at least 160 munitions (with a range of 100 km), about 144 warheads deployed on 48 SLBMs based on 3 of 4 SSBNs. The number of operational munitions may amount to 185 warheads. Permanent combat control is ensured by one SSBN with not more than 48 warheads.[106]

In the 2006 white paper the UK Government proposed to start the development and engineering of the future strategic SSBN, which should be put into service in the 2020s. Abiding by this document is seen as a prerequisite to the "invulnerability guarantee" and "crew motivation." The Government suggested that the new SSBN should be armed with modified Trident II SLBMs (D-5LE) developed in the United States. This would allow the UK to maintain Trident into the beginning of the 2040s.

According to the white paper, the approximate cost of four SSBNs and the related infrastructure is £15–20 billion ($28.5–38 billion in 2006 dollars). Major part of the expenditures (about £1 billion or $1.9 billion per year) will be incurred in 2012–2027.[107]

The UK general public is greatly concerned about the government's plans for transitioning to the new generation U.S. SLBM Trident and modernization of almost the entire arsenal of warheads for this missile, which, according to mass media, is being conducted absolutely un-transparently.

From time to time, the UK faces strong domestic movements for abandonment of that country's nuclear status and nuclear deterrents. The primary reason for that is the fact that a considerable part of British society sees no sense in the country having its own SNF when British military policy, including nuclear policy, is so linked to the United States.

Charles de Gaulle and his associates, with the participation of Frederic Joliot-Curie, a distinguished physicist and member of the French Communist Party, developed France's nuclear forces in defiance of the positions of the United States and Great Britain. France had commenced the implementation of a program aimed at the development of its own nuclear weapons in 1945, but the breakthrough in implementation was made only in 1958, when de Gaulle came to power. According to a number of estimates, France has spent three to four times more money than the United Kingdom to establish an independent nuclear force. This is the price that the French nation decided to pay for the relatively high degree of independence enjoyed by its nuclear deterrent forces.

It was also de Gaulle who established France's missile industry, which was very much unwelcomed by the United States, and then France's own electronic engineering industry and many other things. This was all a manifestation of France's national spirit, because its nuclear forces did not have and still do not have a large military significance. France needed to have its own SNF to vindicate its status as a superpower, especially after it lost its colonies, first of all Algeria. President de Gaulle developed the nation's nuclear forces largely in order to compensate for that loss, which was very painful for France. Having developed France's own weapons, de Gaulle withdrew from the NATO military command in 1967, made a stand against the location of the NATO headquarters in Paris, and expelled 30,000 employees of this organization from France.

France maintains its operationally ready arsenal of about 350 nuclear warheads designated for delivery by SLBMs, carrier-based and land-based strike aircraft.[108]

The basis of France's nuclear deterrent forces is the Strategic Oceanic Force, which has four operationally ready SSBNs that are principally capable of operating in any region of the world's oceans. This seagoing force includes three new Triomphant-class submarines, and one L'Inflexible-class (formerly Redoutable-class) submarine. The latter (L'Inflexible-class SSBN) was to be removed from operational status in 2010, when the fourth and the last Triomphant-class SSBN—Le Terrible—was scheduled to be commissioned. The French SSBNs are armed with 16 Aerospatiale M45 SLBMs (each missile carries up to 6 warheads). In 2010–2015, starting with Le Terrible, the Triomphant-class submarines are being upgraded to M51.1 SLBMs with a longer range. The new missiles will carry up to six warheads, and their maximum range will be 8,000 km (the estimated range of M45 missiles was 4,000 km).[109] Thus, the French SNF are able to provide for the "tous azimuts" deterrence that was postulated by de Gaullists in the beginning of the 1960s.

The French nuclear forces will remain independent of the United States after France, in conformity with the decision of President Nicolas Sarkozy, fully returns to the NATO fold from which de Gaulle withdrew in the 1960s. In March 2008, Sarkozy promised that France "could and should be more transparent with respect to its nuclear arsenal than anyone ever has been."[110]

Chapter 13: Challenges of Limiting Anti-Submarine Warfare

Strategic stability has one more problem component, which definitely requires more attention in most instances. This is the activity of anti-submarine forces of the sides, which in fact can seriously destabilize the situation. And, needless to say, there is always a risk of a collision of submarines, both attack and strategic submarines. It was once again proven when two missile-carrying nuclear submarines—French (Triomphant-class) and British (Vanguard-class)—collided in the Atlantic on 3 February 2009.[111]

Repeated attempts by the Russian side to raise the question of antisubmarine activities in strategic submarine patrol areas were rejected by the U.S. side without any rational arguments with relation to common interests concerning securing of strategic stability. In particular, the Soviet side suggested that the Soviet Union and the United States should reach an agreement on establishment of special zones (for strategic missile-carrying submarines on combat patrol missions), where any antisubmarine activities of the other side would be prohibited. The major challenge related to accomplishment of this task is development of proper verification procedures and measures to control the abidance by such agreement. However, discussion of this issue while preparing for the U.S.-Russia talks seems expedient. Due to the reduction of the number of Russia's strategic missile-carrying submarines, this issue is even more topical for us.

On 25 May 1972, the U.S. and Soviet Governments signed the U.S.-Soviet Incidents at Sea Agreement (which was modified and amended in 1979 and 1986 by mutual agreement of the parties). This agreement played an important role in securing strategic stability and resulted in a drastic reduction of the number of incidents involving ship and aircraft collisions.

Unfortunately, the Agreement and the Protocol thereto do not specify any particular obligations of the parties with respect to prevention of submerged submarine collisions, except for paragraph 7 of Article 3. However, this article concerns the conduct of exercises and maneuvers by the forces in such a way that the activities of each party are visible to the other.[112]

The navies of various countries have guidance documents on the prevention of such incidents. (It is a system of combat practice areas [test ranges], underwater navigation fairways, and assignment of depths during combat exercises. When preparing and conducting exercises, the operational control staffs of the navies thoroughly develop the necessary security measures.)

Experts on both sides probably should discuss additional security measures covering the underwater maneuvering of attack submarines in the course of pursuit and tracking of partner submarines in order to eliminate or at least minimize the risk of dangerous approaches and consequent collisions.

This Agreement prohibits the simulation of attacks against ships and aircraft, and obliges commanders of aircraft of the parties (Article 4) "to use the greatest caution and prudence in approaching aircraft and ships of the other Party operating on and over the high seas."[113]

The same wording would be very useful for commanders of submarines as well.

Chapter 14: The Role of Imbalances on the Level of Conventional Forces and Weapons

At lower nuclear weapon thresholds, the role of the imbalance in conventional weapons and forces, which is quite considerable these days, increases; and Russia will not benefit from this imbalance. (One of the weighty components of this imbalance is the absolute domination of the United States and its allies over the world's oceans. We can deny such domination only in some selected seas that we carefully choose. This was the focus of the formula that was once proposed by the author of this paper for the designation of a Northern Strategic Bastion located in the European part of the Russian polar region and an Eastern Strategic Bastion located in a certain area in the Pacific Ocean.)

In the modern context, it is absolutely impossible to develop adequate formulas of strategic stability without taking these imbalances into consideration, whether they be imbalances in strategic weapons, general-purpose forces, or conventional weapons. These imbalances must be considered on a global basis (with due regard for the strategic mobility capabilities of the sides) or in the context of particular theaters of military operations and regions, especially regions with high political tensions. Recently, one of the most meaningful threats against general strategic stability was the aggression of the pro-Western, pro-U.S. regime of Mikheil Saakashvili against South Ossetia. This aggression was largely encouraged by the large-scale (on a scale of the South Caucasus and Transcaucasia) supply of weapons and military hardware to the Georgian armed forces and the training of Georgia's military personnel. The prevention of such situations in the future is one of the priorities associated with securing strategic stability; a priority that should be the subject of Russia's discussions of a new European security architecture with Western countries.

As a result of rapid development (primarily in the United States) of high-precision long-range (including intercontinental) weapons in recent years, the issue of the vulnerability of various SNF components to such weapons is becoming increasingly topical.[114] This issue was on the agenda back in the 1980s, but nowadays it has reached a qualitatively new level that requires thorough and highly professional consideration in Russia from all points of view—military-political, operational-strategic and military-technical.[115]

As mentioned above, nuclear weapons act as a sort of equalizer of the combat capabilities of the sides.[116] If the problems of limitation and reduction of nuclear weapons are to be taken seriously, we must also take combat capabilities into consideration, taking account important national security interests, no matter how good the political relations may be. And we still do not see any credible signs that the West is ready to eliminate the imbalance in general-purpose forces and conventional weapons or add "non-offensive defense" formulas to its armory.

In this context, U.S. appeals to pursue "absolute nuclear zero" in all countries look special, to put it mildly.

Chapter 15: On the System of "Pre-Nuclear" Deterrence for Russia

Many experts and politicians have long doubted the value of nuclear threshold reduction, rightly believing that alongside reduction of the threshold, any threat to use nuclear weapons becomes less ponderable, even if we talk about random use not against actual targets, but somewhere in the desert, just to demonstrate determination.

Reduction of the nuclear threshold for the Russian armed forces has been to a large extent conditioned by the weakness of Russia's general-purpose forces in the context of the accretion of military-political uncertainty in the world, and of the clearly growing role of the military component of national security.

The problem of cogency of deterrence in the event of reduction of the nuclear threshold in the context of relations with nuclear powers and non-nuclear states requires consideration of other additional measures aimed at enhancing the cogency of deterrence and, consequently, its effectiveness.

There are such opportunities, for example, in the area of use of long-range high-precision weapons of various types and weapons with conventional warheads, including high-precision warheads, using such platforms as, first of all, subsurface and surface combat ships and long-range bombers.

In the beginning of the 1980s, Marshall Nikolai Ogarkov and a number of other experts, including Army Gen. Vitaly Shabanov and members of his team, noted that the yield of conventional munitions was getting close to the yield of low-yield nuclear weapons. Enhancement of guidance accuracy, which has been constantly increasing over the past 15 to 20 years, leads to improvement of conventional warheads' ability to hit a wide variety of military and economic targets. Also, the use of conventional warheads, even high-yield warheads, does not entail the effects that are inevitably associated with the use of any type of nuclear warheads, even mini-nukes that deliver penetrating radiation, causing radioactive contamination of the soil and water.

Any forceful threat to use a high-precision long-range delivery vehicle with a conventional warhead could become the basis of the pre-nuclear deterrence system that amplifies the nuclear deterrence system. In this regard, a potential aggressor must bear in mind that it may expect not just a strike on its military assets and forces, which are deployed and directly targeted at Russia, but on a number of other assets.

The use of such weapons must be politically represented as an act of last warning preceding the selective use of relatively low-yield nuclear munitions.

Such weapons should be primarily used for hitting high-cost assets and complex national security systems that are located relatively far away from densely populated areas. In particular, such objects would include ground-based electronic intelligence centers, large ships of similar designation, communications centers, and command and control centers. As a rule, such assets are located far away from densely populated areas, and their destruction would not entail numerous casualties—be it direct casualties or collateral damage.

At higher stages of escalation, still at the pre-nuclear stage, we could be talking about the destruction of similar civilian targets—such as infrastructural assets located relatively far away from large urban areas—with the aim of minimizing civilian casualties while bringing measurable economic damage to the aggressor. (Nuclear power stations would be exempt from targeting at this phase, given that a strike on such a target may be deemed as a military action involving the use of nuclear munitions.)

Russia's level of scientific and technological development allows us to have such means of pre-nuclear deterrence (sea-based, ground-based and air-based) and to develop them in due course. Meanwhile, it should be borne in mind that the pre-nuclear deterrence system, even more that the nuclear deterrence system, depends on the development of the relevant information infrastructure, including reconnaissance, target assignment, and navigation, among other things.

This is the only way to ensure the selective destruction of the relevant targets. And the adversary should realize that pre-nuclear deterrence is not a bluff, but a real political-military tool in the hands of Russia's leadership that is secured by all the necessary components.

Nuclear deterrence, though important, is not a panacea guaranteeing Russia's national security. It is impossible, even dangerous, to use it to parry or neutralize the entire spectrum of military-political threats to Russia's security. Excessive confidence in nuclear deterrence in national security policy is detrimental and even dangerous for Russia. Nuclear power may only partially compensate for Russia's inferiority in economic and political assets, and in general-purpose military forces. Thus, in addition to other measures, nuclear deterrence must be underpinned by efficient pre-nuclear deterrence. As Russian historian and ideologist of development of the Russian Navy Pyotr Belavenets wrote at the beginning of the 20th century, permanent "readiness to attack the adversary's territory would deter it from attacking our lands." This unjustifiably forgotten author rightly emphasized that this verity always was and always will be true.

List of Abbreviations

ACV: armored combat vehicle

ADMS: air-defense missile system

ALBM: air-launched ballistic missile

ALCM: air-launched cruise missile

ECM: electronic countermeasures

EMP: electromagnetic pulse

GDP: gross domestic product

GLBM: ground-launched ballistic missile

GLCM: ground-launched cruise missile

ICBM: intercontinental ballistic missile

MD: missile defense

MIRV: multiple independently targeted reentry vehicle

MRBM: medium-range ballistic missile

MWS: missile warning system

NM: nuclear munitions

PLA: People's Liberation Army of China

PRC: People's Republic of China

RMA: revolution in military arts

RMMS: rail-mobile missile system

CSS: combat space station

SDI: Strategic Defense Initiative

SLBM: submarine-launched ballistic missile

SMF: strategic missile forces

SNF: strategic nuclear forces

SOA: strategic offensive arms

SRAM: short-range attack missile

SSBN: ship submersible ballistic nuclear

SSS: space surveillance system

WMD: weapons of mass destruction

End Notes

1. Critics claim that the principle of strategic stability, which is based on mutual nuclear deterrence, epitomizes a confrontational approach and that it supposedly hinders the development of political relations with the United States. I can counter such criticism by noting that Russia's national security interests cannot be sacrificed even for the sake of very good political relations with the United States. Critics also note that the traditional formula of strategic stability is based on the "dyad" relationship; therefore, it is practically impossible to involve a third nuclear power in the process of limiting and reducing nuclear weapons.

2. Y. A. Trutnev, "Na blago Rossii: K 75-letiu akademiki RAN Yu. A. Trutneva" ("For the Benefit of Russia: Dedicated to the 75th Anniversary of Academician of the Russian Academy of Sciences Y. A. Trutnev"), Sarov, Saransk: Krasnyi Oktyabr, 2002, p. 334.

3. See Graham Allison, "Nuclear Terrorism: The Ultimate Preventable Catastrophe," New York: Owl Books / Henry Holt, 2005; A. A. Kokoshin, "Zametki o probleme yadernogo terrorizma v sovremennoi mirovoi politike" ("Notes on the Problem of Nuclear Terrorism in Contemporary International Politics"), Moscow: Lenand / URSS, 2006.

4. "Brown pushes for world reduction of nuclear weapons as he makes Iran offer," Guardian, 17 March 2009.

5. The October 1962 Cuban Missile Crisis—called "the Caribbean Crisis" in Russian—is an event of utmost significance in world history. It demands the thoroughgoing examination of scientists and specialists, and, at a minimum, a general examination by state leaders, politicians of various ranks and the supreme military command. I would note the following works on this subject: A. F. Dobrynin, "Sugubo doveritelno: Posol pri sheti prezidentakh SShA: 1962–1968" ("Strictly Confidential: Ambassador to Six U.S. Presidents: 1962–1968"), Moscow, 1997; Graham Allison and Philipp Zelikow, "Essence of Decision: Explaining the Cuban Missile Crisis," New York: Pearson Longman, 1999; A. Fursenko and T. Naftali, "Adskaya igra: Sekretnaya istoriya karibskogo krizisa 1958–1964" ("Hellish Game: A Secret History of the Caribbean Crisis: 1958–1964"), Moscow: Geya iterum, 1999; and S. A. Mikoyan, "Anatomiya karibskogo krizisa" ("Anatomy of the Caribbean Crisis"), Moscow: Academia, 2006.

6. Allison and Zelikow, "Essence of Decision: Explaining the Cuban Missile Crisis," 2nd ed., New York: Pearson Longman, 1999.

7. George Shultz served as U.S. secretary of state for seven years in the administration of President Ronald Reagan. He saw action with the U.S. Marines in World War II.

8. William Perry headed the U.S. Department of Defense in the 1990s during the presidency of Bill Clinton. In the 1970s he served as undersecretary of defense for research and engineering during the Jimmy Carter administration. He is considered to be the "godfather" of an entire series of high-precision long-range conventional weapons. Perry is a professor at Stanford University. He has served on the board of directors of a number of large science-intensive American corporations.

9. Henry A. Kissinger served as national security advisor to the president of the United States for a long period of time. He is one of the most prominent political scientists and historians specializing in diplomacy and international politics. He became a public servant after working at Harvard University where, among other things, he wrote "Nuclear Weapons and Foreign Policy" (1957), which became one of the classical works in this field. He fought in World War II. Kissinger is an author of a number of fundamental works on diplomacy, political science and international relations, which were published after he had finished his political and diplomatic career. His works include "Diplomacy," a Russian translation of which was published in Russia in 1994.

10. Sam Nunn chaired the United States Senate Committee on Armed Services for a number of years. In the 1980s, he played an important role in preserving the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems, publicly opposing then-U.S. President Ronald Reagan and other proponents of the Strategic Defense Initiative.

11. See, for instance: G. D. Kulichkov, VNIIEF, "Istoricheskii ocherk: 1946–1992," Sarov: RFYaTs-VNIIEF, 1998, p. 92.

12. The Interceptor Missile V-1000 had a maximum velocity of 1,000 meters per second. It could intercept a target at an altitude of 25 km. See I. D. Yevtiev, "Iz istorii sozdania zenitnoraketnogo shchita Rossii – o sozdanii zenitnykh upravlyayemykh raket i zenitno-raketnykh kompleksov v Rossii i stranakh NATO" ("From the History of the Development of the Missile Defense Shield of Moscow: On the Development of Guided Missiles for Air Defense Systems in Russia and NATO countries"), Moscow: Vyzovksaya kniga, 2000, p. 75.

13. The decision of the country's leadership on national missile defense is documented in the joint statement of the Central Committee of the CPSU and the Soviet Cabinet of Ministers, released on 4 May 1963 and titled "On the development of the missile defense of the national territory." See M. Pervov, "Sistemy raketno-kosmicheskoi oboroni sozdavalis tak" ("This is How the Space and Missile Defense Systems of the Country were Created"), 2nd ed., AVIARIUS-XXI, 2004, p. 153.

14. Pervov, p. 152.

15. Yevtiev, pp. 123–126.

16. Ibid., p. 172.

17. Pervov, p. 172.

18. Ibid., p. 173.

19. Ibid.

20. Designers calculated that light-weight decoy targets would be "blown away" from the area surrounding the complex ballistic target by the explosion of the interceptor missiles' nuclear warhead, while the more durable target will be subjected to the impact of a mechanic impulse that would alter parameters of their movement. It would then be possible to distinguish ballistic missile warheads by comparing the parameters of the flight of the complex target's elements before and after the nuclear explosion.

21. Pervov, p. 173.

22. McNamara's calculations were to a large extent based on Rand Corporation research. That research was based on methods of complex systems analysis and operational research. Further on, these types of research models were used to provide analytical support for U.S. negotiations during strategic arms control negotiations with the Soviet Union.

23. Kokoshin, "Politologiya i sotsiologiya voyennnoi strategii" ("Political Science and Social Science in Military Strategy"), Moscow: Lenand / URSS, 2005, pp. 285–286.

24. 1980 Republican Platform Text, Congressional Quarterly Almanac, 1980, p. 58-B.

25. Andropov announced the imposition of a unilateral moratorium on testing of anti-satellite weapons by the Soviet Union in May 1983, when meeting with a group of U.S. senators headed by Claiborne Pell. This act of the Soviet Union was first of all initiated by Yevgeny Velikhov, vice president of the Academy of Sciences of the USSR, based on R&D provided by the Soviet Scientists' Committee for Peace, Against the Nuclear Threat. The draft wording of Andropov's statement was prepared by the author of this paper.

26. Western sources said that the Chinese military used a ground-based missile to hit and destroy one of its aging satellites orbiting at an altitude of 900 km above the Earth. "This was a high-stakes test demonstrating China's ability to target regions of space that are home to U.S. spy satellites and space-based missile defense systems," noted the American observers. See Marc Kaufman, Dafna Linzer, "China Criticized for Anti-Satellite Missile Test," Washington Post, 19 January 2007. Available at http://www.washingtonpost.com/wp-dyn/content/article/2007/01/18/AR2007011801029.html.

27. Yale University Prof. Paul Bracken wrote some years ago that "in certain respects, American and Soviet strategic forces have combined into a single gigantic nuclear system."

28. During the same period, designers intensified R&D aimed at the development of warheads for ICBMs and SLBMs that were capable of terminal maneuver, which would drastically complicate their interception by the relevant ABM echelon.

29. The author defines a nuclear conflict as a situation involving one or more nuclear-armed combatants, and in the course of which escalation reaches the level at which one or several parties begin to use nuclear weapons as a political leverage tool. The highest phase of a nuclear conflict means the use of nuclear weapons at various scales—from single nuclear strikes to mass use of nuclear weapons.

30. See Voyenno-entsiklopedicheskii slovar (Military Encyclopedic Dictionary). Edited by S. F. Akhromeyev, 2nd ed., Moscow: Voyenizdat, 1986, p. 843.

31. Kokoshin, "V poiskakh vykhoda: Voyenno-politicheskiye problemy bezopasnosti" ("In Search of a Way Out: Military and Political Problems of International Security"), Moscow: Politizdat, 1989, p. 103.

32. Ibid.

33. See, for example, M. Bunn and K. Tsipis, "Ballistic Missile Guidance and Technical Uncertainties of Countersilo Attack," Report No. 9, MH. August 1983, p. 104.

34. F. von Hippel, "The Effects of Nuclear War," Princeton University Press, 1983, p. 32.

35. W. Dougherty, B. Levi, and F. von Hippel, "The Consequences of Limited Nuclear Attacks on the United States," International Security 10, no. 4, Spring 1986, p. 5.

36. Thus, in their monograph, Yevgeny Chazov, Leonid Ilyin and Angelina Guskova contemplated the consequences of the TNT equivalent of a 1-megaton nuclear strike on a city with a population of 1 million people; depending on the type of burst—air or surface—by the end of the first day 200,000 to 310,000 people will die and 350,000 to 380,000 people will have injuries of varying severity. About 450,000 to 310,000 people will go uninjured (at least, in the beginning). (See E. I. Chazov, L. A. Ilyin, A. K. Guskova, "Yadernaya voina: mediko-biologicheskiye posledstviya. Tochka zreniya sovetskikh uchenykh-medikov" ["Nuclear War: Biomedical Consequences. The Viewpoint of Soviet Medical Scholars"], Moscow: APN, 1984.) In the 1980s, Soviet scientists established contacts with scientists from other countries to study the global long-term climatic and biological impact of nuclear war (on the Soviet side, the research was carried out under the guidance of academician Yevgeny Velikhov). Pursuant to an agreement with the group of U.S. researchers, this work was simultaneously carried out in the Soviet Union under the auspices of the Computation Center of the Academy of Sciences of the USSR and the Institute for the Physics of the Atmosphere of the Academy of Sciences of the USSR, and in the United States by a group of scientists headed by astronomer Carl Sagan and by Paul Ehrlich of the National Center for Atmospheric Research, Lawrence Livermore National Laboratory. The joint activity of the scientists from different countries, who had different political beliefs and used

different methods of scientific research, resulted in a consistent, scientifically grounded and therefore credible collective opinion embodied most perfectly by the terms "nuclear night" and "nuclear winter." The findings became especially cogent due to the fact that despite the differences in programs and methodology, the principal conclusions of the scientists were substantially congruent: use of nuclear arms will lead to sharp changes in the Earth's climate, which will ultimately result in a global environmental collapse. (See "Klimaticheskiye i biologicheskiye posledstviya yadernoi voiny" ["Climatic and Biological Impact of a Nuclear War"], edited by E. P. Velikhov. Moscow: Nauka, 1987, p. 6).

37. Such characteristics include, first of all, the number of warheads in each ballistic missile throw-weight of ICBM and SLBM; the weight-dimension characteristics of missiles; and the bomber's in-flight refueling capabilities.

38. For details, see Pervov, pp. 460–461.

39. In this regard, special attention should be paid to the limitations concerning the development and deployment of various kinds and types of anti-satellite weapons—space-based, ground-based and sea-based, as well as air-launch systems; for quite a while, many experts considered such air-launch systems to be very promising, since they were potentially the most versatile.

40. Pervov, pp. 167–168.

41. For example, the Protocol on Inspections and Continuous Monitoring Activities signed within the framework of the START I Treaty as of 1991 stipulated the following types of inspections and activities: baseline data inspections; suspect-site inspections; warhead inspections; post-dispersal inspections of deployed mobile launchers of ICBMs; close-out inspections; formerly declared facility inspections; technical characteristics exhibitions and inspections; distinguishability exhibitions and inspections; baseline data exhibitions and inspections; and exhibitions of long-range non-nuclear air-launched cruise missiles (ALCMs) pursuant to notification.

42. See Kokoshin, "V poiskakh vykhoda: Voyenno-politicheskiye problemy bezopasnosti" ("In Search of a Way Out: Military and Political Problems of International Security"); V. Z. Dvorkin, "K voprosu o formirovanii politiki natsionalnoi bezopasnosti" ("On the Formation of National Security Policy"), World Economy and Foreign Affairs, 2004, No. 13, pp. 52–56.

43. The material component of nuclear deterrence is a sort of equalizer, since the physical basis of nuclear arms, as well as the technological basis of development of nuclear warheads, delivery vehicles and systems of command and control of strategic forces and nuclear arms as a whole, are basically the same in different countries. The chosen theoretical concept plays a very important role in the nuclear deterrence policy. Here we can agree with one of the leading French military theorists, Gen. Poirier, Charles de Gaulle's teammate, who once said that in the nuclear age, "theory is action." Each side, each nation has its specific, national theory and practice of nuclear deterrence, which reflects the peculiarities of its national psychology and the traditions of its national political and military culture. It is easy to notice that the American, Soviet-Russian and French schools of thought regarding nuclear weapons were built on the same intellectual foundation—European rationalism. However, even at first glance it is clear that the social and cultural basis of Chinese strategic thought is different. In order to get a deeper understanding of the essence of modern Chinese military doctrine and the nuclear component as its integral part, it is necessary to read the military treatises of Mao Zedong and the tracts of Sun Tzu, the military commander and theorist who lived in the sixth and fifth centuries BC, which today are a sort of Bible of China's "Politburo of the Politburo"—the Central Military Commission of the People's Republic of China (PRC)—with the General Staff of the People's Liberation Army (PLA) of China as its integral part. The classic Chinese military heritage with its cornerstone concept of "winning without fighting" turned out to be consonant with the philosophy of nuclear deterrence, which is based on the virtual impact of the other side's perception.

44. Trutnev, p. 340.

45. This strike hypothetically may be delivered in accordance with the "dead hand" principle, even when the centralized SNF command and control system is hit.

46. The country's top leadership have minimum time to make a decision on delivery of a retaliatory launch-under-attack counterstrike, let alone the counter-assault. In the event of a decapitation strike delivered with MRBMs that have a short fly-in time (for example, Pershing II, which the U.S. planned to deploy in Europe in the 1980s, or Soviet sea-launched missiles with low trajectories, which were capable of hitting the U.S. capital of Washington from the Atlantic), the leadership has practically no time to make a decision.

47. See V. Z. Dvorkin "K voprosu o formirovanii politiki natsionalnoi bezopasnosti" ("On the Formation of National Security Policy"), World Economy and Foreign Affairs, no. 13, 2004.

48. See A. A. Kokoshin. "Formirovanie politiki 'asimmetrichnogo otveta' na 'SOI': Opyt mezhditsiplinarnogo vzaimodeistviya. Izbrannye lektsii." ("Formation of the Policy of 'Asymmetric Response' to SDI: Interdisciplinary Cooperation Experience: Selected Lectures."), Saint Petersburg: Saint Petersburg University of Humanities and Social Sciences, 2008, Issue No. 85.

49. MEP is defined as military-economic potential.

50. De jure concentration of colossal, unprecedented powers in the hands of one person (head of the state) suggests that the relevant leader must have special qualities: first of all, high stress-tolerance, and good knowledge of conflict escalation and de-escalation mechanisms, as well as mechanisms of management of the country's armed forces (which, as history tells us, again and again tends to fall out of the control of the civil political leaders and the military command in the event of a severe crisis).

51. Trutnev, p. 333.

52. Such a function could be entrusted to the apparatus of the Security Council of the Russian Federation by including the relevant department and experts in the organizational structure of the Council; such activity was supposed to be carried out by the State Military Inspection of the Defense Council and later by the Security Council of the Russian Federation.

53. Herman Kann, "On Escalation: Metaphors and Scenarios," Baltimore, Maryland: Penguin Books, 1968, p. 39.

54. R. H. Betts, "Nuclear Blackmail and Nuclear Balance," Washington: The Brookings Institution, 1987, p. 3.

55. S. Hoffman, "The State of War: Essays on the Theory and Practice of International Politics," New York: Praeger, 1965, p. 236.

56. Analysis of such mistakes should also be the subject of special training courses organized in the Military Academy of the Gen. Staff of the Armed Forces of the Russian Federation.

57. Nuclear sub-kiloton warheads (with a TNT-equivalent nuclear explosive yield of less than 1,000 tons) play a special role; they have recurrently become the subject of debates in the United States over the past 15 to 20 years.

58. It is well known that in the Soviet Union, development of such nuclear munitions was demurred by the Minister of Atomic Industry of the USSR Yefim Slavsky; he believed that this led to a dangerous decrease in the "nuclear threshold" and that the responsibility for the use of nuclear weapons was entrusted to the command of a very low degree. There were a number of distinguished public figures in the U.S. who were also against development of such warfare.

59. The U.S. and its NATO allies planned to use tactical nuclear weapons at a relatively early stage of a large-scale war in Europe against a threat of losing a conventional war with the Soviet Union and its allies. It was believed that the Soviet troops had advantageous configuration, structure and composition to defeat the NATO task force in the center, on the territory of the Federal Republic of Germany. The most perilous location was the Fulda Gap. The anticipated activities included not just delivery of single and group nuclear strikes on the advancing Soviet troops, but also the use of nuclear mines, which would create absolute obstacles for the main striking force of the USSR: the armored forces. Evidently the general public (and a substantial part of the Bundeswehr command) in the Federal Republic of Germany and Western Europe as a whole were quite hostile to those plans. This encouraged development of various formulas of "non-offensive defense" with no use of nuclear munitions.

60. "Armaments, Disarmament and International Security," SIPRI Yearbook 2007. Translated from English for the Russian edition. Edited by A. A. Dynkin, A. G. Arbatov, V. G. Baranovsky, A. A. Panayev, A. N. Kaliadin and A. G. Lisov Moscow: IMEMO RAN, 2008, pp. 560–561.

61. See "Yadernoye oruzhie posle 'kholodnoi voiny'" ("Nuclear Weapons after the Cold War"), edited by A. G. Arbatov and V. Z. Dvorkin. Moscow: ROSSPEN, 2006, p. 34.

62. In the 1970s, when the Soviet-American treaties on limitation and reduction of nuclear arms were concluded, the situation of "mutually assured destruction" and consequently the possibility of winning a war with massive use of nuclear weapons practically was not covered by the Soviet propaganda inside the country.

63. "Yadernoye oruzhie posle 'kholodnoi voiny'" ("Nuclear Weapons after the Cold War"), edited by A. G. Arbatov and V. Z. Dvorkin. Moscow: ROSSPEN, 2006, p. 34.

64. Reagan's speech on the matter aroused a stormy reaction on the part of many Soviet leaders. By that time, Russian-U.S. relations had already been far from perfect due to, inter alia, the bringing of a large contingent of Soviet troops to Afghanistan in 1979. It was almost a hysteria that engulfed Russia's political class, starting with the Politburo, and a major part of the Soviet high military command. Generally speaking, that was what the Americans had been striving for: they wanted to make Russia seriously afraid of the prospect of implementation of the SDI program. As academician G. A. Arbatov writes in his memoirs, then-U.S. President Ronald Reagan, when evaluating such reactions on the part of Soviet leaders, said that "the weapons could not be that bad, if the Russians protest against them so fiercely." Arbatov rightly believes that such an eruption of hysteria on the Soviet side simply convinced Washington that "we were afraid of SDI." G. A. Arbatov, "Chelovek sistemy" ("Man of the System"), Moscow: Vagrius, 2002, p. 265.

65. L. Freedman, "Deterrence," Cambridge, UK: Policy Press, 2001, p. 48.

66. See, for example, M. Kaku and D. Axelrod, "To Win a Nuclear War: The Pentagon's Secret War Plans," Boston: South End Press, 1987.

67. M. Wallop, "Opportunities and Imperatives of Ballistic Missile Defense," Strategic Review, fall 1979.

68. See V. Shabanov, "Chto stoit za 'technologicheskim ryvkom' v kosmos?" ("What is behind the 'Technological Race' to Space?"), Izvestia, 27 July 1985.

69. It should be noted that at the turn of the 1960s through the 1970s, along with the development of the "classic" missile defense systems, a number of Soviet scientists and experts considered the idea of using non-traditional weapons based on new physical principles: for example, charges and charged particles beams for hitting warheads at the terminal stage. The scientists had started work in that area, which later proved to be a blind alley, and soon after that was scaled down. Empty structures at the testing area near lake Balkhash, which later regularly caused stormy discussions in the United States, became the dumb witnesses of those efforts. Around the same time, i.e. 10 years before the SDI program, the concepts of space-based BMD systems emerged in the Soviet Union under the influence of achievements in space technologies. Such an idea was first put forward by academician Gersh I. Budker, but it was criticized by academicians Lev Artsimovich and Boris Konstantinov and discarded. Another type of space BMD system (using interceptor missiles at space combat stations) was put forward by academician Vladimir Chelomei. He made his

idea known to Brezhnev, but it was also discarded after the discussion and fierce contestation at the highest level. Academician Yevgeny Velikhov rightly remarked that those discussions had fostered a sort of immunity to such "star wars" ideas in the Soviet scientific community.

70. Strobe Talbott, "The Master of the Game: Paul Nitze and the Nuclear Peace," New York: Knopf, 1988, p. 217.

71. See M. A. Gareyev, "Strategicheskoye sderzhivanie: problemy i resheniya" ("Strategic Deterrence: Problems and Solutions"), Krasnaya Zvezda, 8 October 2008.

72. See, first of all, A. A. Svechin, "Strategiya" ("Strategy"), Moscow: Voyenny Vestnik, 1926.

73. This is attained through some losses for the "throw-weight" (the weight that a missile delivers to the ballistic trajectory), but these losses turn out to be justified.

74. See "Kosmicheskoye oruzhie: dilemma bezopasnosti" ("Space Weapons: Security Dilemma"), exec. eds. E. P. Velikhov, A. A. Kokoshin, and R. Z. Sagdeyev Moscow: Mir, 1986; S. K. Oznobischev, V. Ya. Potapov, V. V. Skokov, "Kak gotovilsya 'asimmetrichny otvet' na 'Strategicheskuyu oboronnuyu initsiativu' R. Reigana" ("How the 'Asymmetric Response' to R. Reagan's 'Strategic Defense Initiative Was Prepared"), Velikhov, Kokoshin et al., Moscow: Lenand / URSS, 2008; A. Fenenko, "Asimmetrichny otvet v novom veke" ("Asymmetric Response in the New Century"), Mezhdunarodnye protsessy 6, no. 3/18, September-December 2008, pp. 121–125.

75. "Udarnye kosmicheskiye vooruzheniya i mezhdunarodnaya bezopasnost: Doklad Komiteta sovetskikh uchenykh v zaschitu mira, protiv yadernoi ugrozy" ("Space Strike Weapons and International Security: Report of the Soviet Scientists' Committee for Peace Against the Nuclear Threat"), concise abridged version, Moscow: APN, 1985, p. 41.

76. In all, according to the estimates of Soviet scientist Alexander Vasiliev, in the event of complete implementation of the plans on development and build-up of the U.S. strategic nuclear forces, which were projected in the first half of the 1980s, the U.S. "counterforce" potential could increase about six times by the second half of the 1990s compared to 1983. See A. A. Vasiliev, "Nekotorye tendentsii razvitiya strategicheskikh yadernykh sil Soedininnykh Shtatov Ameriki i ikh protivosilovykh kharakteristik do vtoroi poloviny 1990-kh godov" ("Certain Trends of Development of the U.S. Strategic Nuclear Forces and its Counterforce Characteristics through the Second Half of the 1990s"). See also "Problema zamorazhivaniya yadernogo oruzhiya: Doklad Komiteta sovetskikh uchenykh v zaschitu mira, protiv yadernoi ugrozy" ("Nuclear Weapons Freeze Problems: Report of the Soviet Scientists' Committee for Peace against the Nuclear Threat"), Moscow, 1984, p. 27.

77. Central Europe, by virtue of its strategically crucial location, for quite a while has had a special position within the system of military and political relations on the European continent. This region has the most extensive and substantial traffic network, a very high density of the population and a very high degree of industrial clustering. Therefore, if a military conflict broke out in Central Europe, it could have easily spread to any other region on the continent, especially if we take account of the operating range and destructive potential of the tactical and operational-tactical nuclear weapons deployed in the region. It was exactly this theater of military operations where the opposing forces were primarily meant to become non-offensive.

78. In this respect we welcome the use of the term "non-offensive defense" for defining the basic principles of development of regimes for arms control, confidence-building, military restraint and reasonable adequacy in military development in the Russian "advanced version of the elements of the European Security Treaty," which was presented by Russian Minister of Foreign Affairs Sergei Lavrov in his address to the OSCE Ministerial Council at a breakfast meeting on 5 December 2008. http://www.mid.ru/brp 4.nsf/2fee282eb6df40e643256999005e6e8c/ 4d65fb04bac5fb77c325751600475915?OpenDocument

79. If we talk about an increase in combat capabilities of the Russian Federation, then we should first of all discuss the entire complex of information-analysis facilities united into a powerful flexible super-system (or the "system of systems") that covers all control links. The management (control) component of the revolution in military affairs is often overlooked by both the analysts and practical managers. However, it is becoming especially important by virtue of the nature of present-day combat, operations and ongoing paradigm shifts in the forms and the methods of warfare, which tend to become more and more complex. We are witnessing a considerable increase in the number of components of global armed forces and in the sophistication of battle arrays; this requires more in-depth refinement of interaction between the aforementioned components—vertically, horizontally, in various matrix combinations, and integrally. This system must have highly integrated means of reconnaissance, surveillance, communications, telecommunications, navigation, relaying, target designation, topographical surveying, detection of launches of new-generation ballistic missiles, target-recognition, control, missile-strike systems, aviation, and electronic warfare providing for absolute superiority on the battlefield at least for a relatively short period of time. (In particular, there is a long overdue need to make an inventory of the technical reconnaissance assets of the Main Intelligence Directorate, the Navy, the Air Forces and the Ground Forces in order to provide for their subsequent integration and unification, as well as the possibility of their conjugation with electronic warfare.) The availability of uniform standardized tools and protocols for data processing and presentation plays an important role in this system. International and Russian experience shows that this task is extremely topical, in particular, for intelligence services in general and for certain components of intelligence services in particular. Meanwhile, present-day war is in many respects a war between competing intelligence services.

80. For more details, see Kokoshin, "Innovatsionnye vooruzhennye sily i revolyutsiya v voyennom dele" ("Innovative Armed Forces and the Revolution in Military Arts"), Moscow: Lenand / URSS, 2009.

81. Electronic warfare is a means of reduction of the opponent's real combat efficiency, a means of misinformation and deception of the opponent, and a means of defragmentation of the opponent's control system. Electronic countermeasures should ultimately result in suppression of the adversary's will to resist; the will must be suppressed exactly when it is necessary to take and retain the initiative (strategic, operational, and tactical). It is such suppression of the will to resist, which is the principal task of any warfare, notwithstanding the still prevailing opinion that the most important factor is physical annihilation of the adversary's troops and military hardware.

82. In this area, like in many other areas, as a result of assignment of unrealistic, overstated tasks, operational and combat training for the command staff becomes “decorative.”

83. The problem of non-proliferation of biological and bacteriological weapons is equally (or even more) important from the point of view of actually securing strategic stability, especially in the context of the latest achievements in gene engineering and the extensive work that is carried out in that field by state, academic, and corporate research and development centers. The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction as of 1972 definitely needs amendment and elaboration. However, from what I can see, this issue is beyond the scope of strategic stability in its current understanding.

84. In the beginning of the 1990s, Trutnev wrote that the attained level of development of nuclear-power engineering in the Third World countries (the total volume amounted to 50 percent of the volume of nuclear-power engineering in the USSR) stipulated the annual use of a substantial amount of uranium fuel that amounted to 400 to 500 tons of uranium dioxide (where the uranium-235 enrichment level was 3 percent). According to Trutnev’s estimate, “this amount is sufficient (if the relevant decision is made) for making 15 tons of weapon-grade uranium highly enriched with isotope U235 and production of several hundreds of warheads with relatively high parameters.” Another opportunity to use nuclear-power engineering for establishing nuclear arsenals in the Third World countries is the use of transuranium elements contained in the spent fuel. According to Trutnev’s estimates, the annual amount of plutonium isotopes at the aforementioned reactors at that time amounted to between 3 and 4 tons, which was also sufficient for making many hundreds of nuclear warheads. See Trutnev, p. 337.

85. Several estimates show that by the first quarter of 2009, Iran enough low-enriched uranium to manufacture at least one nuclear warhead if the uranium were reprocessed into highly-enriched uranium.

86. It is believed that Israel’s nuclear-warhead delivery vehicles may include fighter-bomber aircraft with a combat radius of 1,600 km, ground-launched Jericho ballistic missiles with a range of 1,500 to 1,800 km, and sea-based cruise missiles launched from non-nuclear vessels like the German-made Dolphin submarines that Israel buys abroad. There is speculation that Israel has produced such nuclear munitions as artillery shells and mines. See “Armaments, Disarmament and International Security,” SIPRI Yearbook 2007, pp. 590–591. The estimated number of Israel’s nuclear munitions is 100 to 200 plutonium warheads. Israel predominantly adheres to the policy of “nuclear uncertainty,” officially neither confirming nor refuting the fact that it has nuclear weapons.

87. See Graham Allison, “Nuclear Terrorism: The Ultimate Preventable Catastrophe,” New York: Owl Books / Henry Holt, 2005, pp. 76–77.

88. The continuing erosion of the situation in Afghanistan and Northern Pakistan to the advantage of Islamic terrorists constitutes a threat that at a certain moment, Pakistan’s nuclear weapons may to one extent or another (directly or indirectly) end up in the hands of Islamic extremists, with all the ensuing consequences. Unchecked further development of the situation in the aforementioned zone will force Russia and its allies, under the Collective Security Treaty Organization and the Shanghai Cooperation Organization, to make certain new decisions. In this respect, a special role should be played by Russia’s agreements with China, India and Iran, which should constitute the basis of Russia’s policy toward Afghanistan, Pakistan and the activities of the United States and its NATO allies in this region.

89. S. A. Oborotov, “Yaderny factor v amerikano-indiyskikh otnosheniyakh” (“The Nuclear Factor in U.S.-India Relations”), 1991–2008. Moscow Librocom/URSS, 2009, p. 104.

90. Oborotov notes that tactical and technical characteristics of the Ghauri were superior to those of India’s short-range Prithvi missile, which was ready for deployment, while the medium-range Agni missile was still under development and needed to be tested. See S. A. Oborotov, op. cit., pp. 102–103.

91. Oborotov, op. cit., p. 103.

92. Ibid., pp. 104–110.

93. Ibid., pp. 112–113.

94. V. I. Sotnikov, “Yadernaya problema v indo-pakistanskikh otnosheniyakh (vtoraya polovina XX – nachalo XXI v.)” (“The Nuclear Problem in India-Pakistan Relations [Second Half of the 20th Century—Beginning of the 21st Century]”), Moscow: Nauchnaya Kniga, 2003, pp. 160–161.

95. “We have made clear that the system we intend to pursue with Russia will not be a joint system, and it will not in any way limit United States’ or NATO’s missile defense capabilities,” Letter from U.S. President Barack Obama to U.S. Senate Majority Leader Harry M. Reid, 19 December 2010. Available at:

http://www.america.gov/st/texttrans-english/2010/December/20101220112111su0.6327565.html#ixzz1HjNgkHn6

96. A number of U.S. experts and representatives of the military department express grave dissatisfaction and serious concerns about the problems of modernization of the U.S. nuclear weapons complex and its ability to provide for modernization of the U.S. nuclear weapons arsenal.

97. The Strategic Offensive Reductions Treaty (SORT) between the United States and the Russian Federation as of 24 May 2002 mentions the necessity of building of “a qualitatively new foundation for strategic relations between the Parties,” and the desire “to establish a genuine partnership based on the principles of mutual security, cooperation, trust, openness, and predictability.” We all know very well how Washington de-facto implemented these principles.

98. Bulletin of the Atomic Scientists. July–August 2008, p. 43; "Armaments, Disarmament and International Security," SIPRI Yearbook 2007. Translated from English for the Russian edition. Edited by A. A. Dynkin, A. G. Arbatov, V. G. Baranovsky, A. A. Panayev, A. N. Kaliadin and A. G. Lisov, Moscow: IMEMO RAN, 2008, p. 61.

99. M. D. Maples, Director, U.S. Defense Intelligence Agency, "Current and projected national security threats to the United States," statement for the record, U.S. Senate Armed Services Committee, 28 February 2006. H. M. Kristensen, R. S. Norris and M. G. McKinzie, "Chinese Nuclear Forces and U.S. Nuclear War Planning," Federation of American Scientists and Natural Resources Defense Council, Washington, November 2006, p. 37. URL: http://www.fas.org/nuke/guide/china/Book2006.pdf.

100. J. Lewis, "The ambiguous arsenal," Bulletin of the Atomic Scientists 61, no. 3, May–June 2005, pp. 52–59.

101. Chinese State Council, "China's National Defense in 2006," Information Office of the State Council of the People's Republic of China: Beijing, December 2006, URL: http://www.chana.org.cn/english/features/book/194421.htm.

102. Trutnev, p. 577.

103. It is entirely possible that the relations between the two future superpowers (United States and China) will considerably differ from the relations that existed under the bipolar structure of world policy, when the Soviet Union and the United States had been the two superpowers and when there had been two ideological, political, military and strategic poles from 1945 through 1991. The United States and China may continue to develop closer relations in the form of economic, scientific and industrial symbiosis with multiple intercrossing complex combinations of rivalry and cooperation, where rivalry does not escalate into grave conflicts. It is necessary to keep in mind the traditionally high degree of pragmatism of the major part of the Chinese political class and the potential growth of the political heft of the U.S.-oriented Chinese business class, and the growing role of hundreds of thousands and even millions of technocrats, managers and businessmen who have undergone training in the United States. The United States will be pushed into such symbiotic coexistence by virtue of traditional Anglo-Saxon rationality and by the perception of the objectively growing economic power of China. However, we should not rule out the possibility of a worsening of U.S.-China relations at some point. It should be once again noted that the most probable reason for such a worsening may be the aggravation of the Taiwan situation, since the securing of China's sovereignty over Taiwan is as important for the stability of the political power and the entire political system of China as is the securing of a high growth rate for the Chinese economy, which in the foreseeable future depends on further expansion of Chinese producers on the U.S. market and on the degree of accessibility of advanced U.S. technologies for Chinese companies. Perception of the current U.S. policy toward China as a policy aimed at the dissolution and fragmentation of China and the liquidation of its communist regime considerably raises the stakes in the U.S.-China stand-off, including nuclear confrontation. In the event of such U.S. threat not just to China's government, but to many millions of government officials, the Party apparatus and the command staff of the People's Liberation Army (PLA) of China, the struggle with the United States will be the struggle for not just their political endurance, but for social, economic and even physical survival. And this may result in mobilization of defensive resources in this rapidly economically growing country in such a scale that practically nobody in the United States could estimate right now.

104. For more details, see "Armaments, Disarmament and International Security," SIPRI Yearbook 2007.

105. On the eve of 9/11, this opposition in the U.S. Senate was quite large. The Democratic leadership had formulated a number of conditions under which they would consider the possibility of further promotion of establishment of the missile defense systems. In fact, those conditions were so strict that they even blocked the development of a number of the most important components of the missile defense systems. Opponents of the establishment of the missile defense systems in 2001 planned to do the same thing that their predecessors managed to do with Reagan's Strategic Defense Initiative, which had basically not passed the research (and partially the development) stage in the 1980s.

106. "Armaments, Disarmament and International Security," SIPRI Yearbook 2007, p. 352.

107. Ibid.

108. Ibid.

109. "Armaments, Disarmament and International Security," SIPRI Yearbook 2007, p. 673.

110. R. Temirbayev, "O putiakh dvizheniya k miru bez yadernogo oruzhiya" ("On Ways toward a Nuclear-Free World"), Indeks Bezopasnosti (Security Index) 15, no. 1, spring 2009, p.88.

111. Experts note that it is very difficult to detect the depth of the "partner" with modern hydro-acoustic surveillance systems. When on duty, submarines choose their submergence-depth based on sea hydrology, which is measured during submergence, and on the assigned task.

112. It should be kept in mind the submergence depth of a submarine is limited by the depth-pressure restrictions that are imposed with respect to the delivery vehicles for torpedoes, and even more so for the missile-delivery vehicles.

113. Full text of the the U.S.-Soviet Incidents at Sea Agreement is available at: http://www.armscontrol.ru/start/Rus/docs/incsea.htm

114. First of all, this refers to thousands of strategic cruise missiles with low vulnerability to existing missile defense systems; we can also mention the increasingly growing arsenals (with many thousand missiles) of operational-tactical and operational cruise missiles of Russia's "opponents." We will see massive use of unmanned strike aircraft with relatively small high-precision warheads, which, if used on a large scale, are able to ensure what Alexander Svechin called the "attrition effect."

115. The most detailed analysis of this problem was made by Army Gen. Vitaly Shabanov and a group of officers who worked with him.

116. This is clearly illustrated, for example, by the military policy of Pakistan, which is considerably inferior to India's in terms of general-purpose assets and forces, conventional weapons, industrial capacity and territory.

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