De-alerting Russian and US nuclear weapons: A path to reducing nuclear dangers

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High Degree Of Alert Of Nuclear Arms And Accident As A Factor In The Emergence Of A War

> *"We must beware, lest the Stone Age return upon the gleaming wings of science."*
> *–Winston Churchill*

Sections

The danger which stems from maintaining excessive nuclear arsenals and from the potential of their use, has forced the U.S.S.R. and the US.A. to embark on negotiations and to enter into agreements on the reduction of nuclear forces. The recycling of missiles and equipment under INF Treaty has been

completed; START I is nearing fulfillment. START II has been signed, but has not yet come into force. Numerous statements have been made at the highest level concerning the desire to achieve deep cuts in the strategic nuclear forces of the two countries. However, neither the end of the Cold War nor the obvious progress in the area of nuclear arms limitation and verification and the repeated statements by the leaders of the two countries that Russia and the United States are no longer strategic adversaries, have made any qualitative changes in their military and political relations. According to experts, as of today, Russia and the United States each possess approximately 6,000 strategic weapons. In this, a significant portion of the nuclear warheads is continuously maintained on high alert. This means that Russian or U.S. IBMs can be launched in just minutes upon the receipt of the launch command, and the SLBMs deployed on the patrolling strategic submarines can be launched in 15 minutes. The total number of warheads maintained on high alert by both the Russian and the U.S. side equals 3,500-4,000. [1]

It seems that the launch-on-warning concept, which presupposes continuous combat readiness of the most vulnerable systems, such as silo-launched ICBMs, coupled with a flawed early warning system (EWS), increases the probability of an accidental nuclear war. The most apparent way to prevent the consequences of a mistake or incorrect interpretation of EWS data is to de-alert the strategic nuclear forces and to extend the decision-making time vis-a-vis a nuclear attack. The decision to de-alert would also promote progress on the way toward SNF reductions, while preserving the deterrence potential. If nuclear forces of both sides are maintained at lower levels of combat readiness, there is no need to have large quantities of warheads and delivery vehicles, which are maintained out of the fear that a large portion of the arsenal could be destroyed in a preventive surprise strike by the adversary.

“Accidental Nuclear War” As A New Historic Phenomenon

Mutual mistrust and suspicions between the U.S.S.R. and the United States, evolving for decades following the end of World War II, gradually led to the development of long-range, high-charge, high-precision nuclear weapons systems with a high degree of combat readiness. It is particularly characteristic of the ground-launched and sea-launched nuclear missile arsenals of the two countries which are maintained on high alert, ready to be launched upon the receipt of a corresponding command. The missiles in silos have the highest degree of alert, about one minute, while missiles on submarines can be launched within 15 minutes, and the combat-ready bombers can take off within 5 minutes. In Russia, in peacetime conditions, heavy bombers are not maintained on alert. They fly in accordance with combat training plans, without nuclear missiles on board. Simulations of a nuclear attack have shown that the political leadership of the country, in order to prevent the loss of their own offensive arms, will be forced to make the decision to deliver a retaliatory strike within an extremely short period of time (3-4 minutes).

The capability of delivering a sudden massive strike on the SNF of the adversary and thus leave it defenseless, has forced the U.S.S.R. and the U.S.A. to turn to the launch-on-warning concept (in which a retaliatory strike is directed at the adversary prior to its nuclear warheads hitting their targets). The high degree of combat readiness, coupled with the launch-on-warning concept, the few minutes allotted for decision-making, and the enormous destructive power of nuclear weapons, has brought to life a brand new phenomenon called “accidental nuclear war.” The realistic nature of this virtual threat is manifested, for instance, in the fact that the combined charge of warheads carried by a single U.S. MX missile or by a single Russian SS-18 missile approximates the overall charge of all the munitions detonated during the entire duration of World War II. That said, we should mention that MX and SS-18 missiles constitute only a portion of nuclear armaments of the United States and Russia which are maintained in a constant

alert configuration.

An accidental launch of an intercontinental missile, from land or from sea, or a detonation of a nuclear warhead on the territory of another country, capable of destroying an entire city in a blink of an eye, can, just like the infamous 1914 Saraevo shot, put the mechanism of World War III in motion in a matter of seconds. The utmost sophistication of modern weaponry and the continuous effort to increase the degree of its combat readiness objectively promote a higher risk of its accidental self-activation. The highest danger lies in the launch of all weapons which are maintained on alert, in an exchange of massive nuclear strikes.

The placement of electronic locks on nuclear weapons, which require a special coded signal to be keyed in, in order to activate the weapons for combat employment, and the creation of various safety systems with multiple redundancies meant to prevent accidental self-activation of weapons, have significantly improved the operational safety of nuclear weapons while also decreasing the probability of their inadvertent or unauthorized combat employment. However, all these measures cannot fully guarantee the prevention of “non-standard” situations involving nuclear weapons which can potentially lead to severe consequences. This conclusion is particularly topical for Russia and the United States as owners of immense nuclear arsenals, and also for “young” nuclear nations, which currently do not have a more or less established nuclear safety system. It is customary to believe that only the United States and Russia maintain their nuclear forces in a state of constant alert. [2]

However, this does not mean that other nuclear nations, as they upgrade their forces, will not follow the example set by Russia and the U.S.A. To prevent that from happening, Russia and the United States should de-alert their respective nuclear armaments.

As we know, the strategic nuclear forces of Russia and the United States possess all the three forms of combat capabilities: preventive (first) strike; launch-on-warning; and retaliatory strike capabilities. Deep ideological and political contradictions which developed between the two countries during the years of the Cold War gave rise to mistrust and suspicions which run just as deep and which have repeatedly brought about crisis situations. In the Cold War environment, both nations considered the launch-on-warning to be the primary form of combat, which determined the necessity to keep the forces on hair-trigger alert, ready to be employed literally in tens of seconds. Launch-on-warning, although significantly less topical now (compared to the Cold War period), continues to be the foundation of the nuclear policy of both Russia and the United States.

Attachment to launch-on-warning plays a more important role for Russia, whose primary strategic nuclear potential is concentrated on ground-launched missiles kept in silos. It is a known fact that given the modern-day precision and power characteristics of the U.S. strategic offensive arms, silo launchers can be destroyed by just one guided missile with a high degree of probability. If the United States abandoned the task of maintaining their SNF at high alert thus ceasing to pose a potential threat from the point of view of delivering a disabling strike, the launch-on-warning concept would become less important for Russia.

In order to assure a high degree of survivability, mobile missile systems must be in continuous random motion within the positioning area. However, in reality, they are kept most of the time in stationary shelters, thus increasing the probability of being hit in a surprise attack. At the same time, there can be no doubt that in the post-Cold War environment, both sides must take practical steps towards abandoning the launch-on-warning posture in favor of a purely retaliatory stance. This presupposes the extension of time

required to prepare the missiles for launch, so that a nuclear war could not be started due to human or computer error.

The high alert status of nuclear weapons increases the risk of an accidental nuclear war for a number of reasons, which can be grouped as follows:

- data processing and combat command and control systems errors;
- technical faults and failures of combat systems;
- inadequate evaluation of the evolving situation by the top political and military command and erroneous decision-making; and
- erroneous or unauthorized actions as well as mental breakdowns of the attending military personnel in charge of the nuclear weapons.

Effect of Errors In The Data Processing And Combat Command And Control Systems On The Probability Of An Accidental Nuclear Conflict

As historical experience demonstrates, the highest potential danger of an accidental nuclear conflict lies in the reconnaissance data gathering systems, command and control systems and early warning systems (EWS). Let us look at the problem based on EWS operation example. As we all know, the early warning systems of both Russia and the United States are based on complex radio-technical and infrared equipment systems, both ground-based and space-based, are highly automated and saturated with fast-acting computers. This is precisely the system which outputs the initial signal which serves as the basis for making the launch-on-warning decision. The non-absolute reliability of the early warning systems could lead to a nuclear conflict despite the will of the top political command of the nation, due to the fact that erroneous information and the high degree of combat readiness of nuclear weapons could be at the core of the decision-making process. History knows many incidents of early warning systems giving false alarms of an incoming nuclear missile attack by the adversary.

Here are just a few examples. In 1961, U.S. early-warning radar registered a sudden emergence of a multitude of unknown objects flying at a great speed towards the United States. After this data has been processed in the system, the Strategic Air Command (SAC) immediately put its forces on combat alert. Everything was ready for a strike, and only some time later it was discovered that all the panic had been caused by the flying fragments of the detonated tank of the U.S. Transit satellite.

In June of 1980, the warning system located at the SAC command post near Omaha, Nebraska, gave a signal of an incoming submarine-launched ballistic missile attack. All the B-52 bomber crews on duty received the command to take their places and turn on the engines. The airborne command post was readied for takeoff as well. Only three minutes later did it become clear that it was a false alarm, and an all-clear signal sounded. Subsequent investigation of the incident revealed that the false alarm had been caused by the malfunctioning of a 50-cent computer microchip of the early warning system. A steel spill at a metallurgical plant, when observed from space, can be mistaken for a missile launch. According to experts, during the 1980?s, false initial signals were registered 6 times daily on average by the early warning systems.

Similar incidents occurred in the operation of the Soviet (Russian) EWS as well. In January of 1982,

Soviet radar covering the southward direction registered an incoming ballistic missile. In response to this signal, the command post was put on heightened combat alert. Only several minutes later did it become clear that the cause for the alarm had been the test launch by Israel of the Jericho-2 missile, which had a flight range of 1,450 km and therefore did not pose any threat to the U.S.S.R. In June of 1985, the radar covering eastward direction registered a ballistic missile flying within the surveillance area. The signal was so strong that the target was immediately followed. Further analysis of the moving target at the command post revealed that the signal had been generated by a satellite possessing high reflectivity to solar light.

Following the breakup of the Soviet Union, the Russian early warning system was put to a hard test. Out of the nine EWS radars, only three remained within Russia, while the rest of the radars ended up on the territory of other Commonwealth countries: two in Ukraine, and one each in Azerbaijan, Kazakhstan, Belorussia and Latvia. At the urge of the Latvian government, the radar located on its territory was dismantled, thus baring the north-western direction of potential missile attack. According to the agreement with the countries of the Commonwealth, the remaining radars stay in operation for the common good of all involved. The north-western direction will be covered by the radar which is now being built near Baranovichi, Belorussia. The issue of the status of the Gabalinsk radar in Azerbaijan, the crew of which has to operate under complex conditions, remains unsettled. In addition to the above, Ukraine and Azerbaijan are part of GUUAM [3], whose members often diverge from Russia in their opinion on security issues. Therefore, one cannot rule out the impossibility of Russia's using radars located in Ukraine and Azerbaijan.

We should acknowledge that the operational reliability of a branched-out early warning system is inferior to that of the single early missile warning system of the former U.S.S.R. An indirect proof can be found in the incident involving an accidental destruction of the Russian passenger airliner with an S-200 antiaircraft missile fired during a drill in October of 2001 by the Ukrainian Air Defense Forces. This demonstrated the deterioration and lack of reliability of a number of EWS-related components of the Ukrainian armed forces.

The situation is further aggravated by the fact that the Russian EWS space complex has been seriously weakened in the recent years due to economic hardships suffered by the nation, and is currently operating in its abbreviated configuration. All of the above lowers the degree of assuredness of the failure-free operation of the Russian EWS, thus dictating the necessity to abandon the concept of launching nuclear missiles "on warning."

Widely publicized has been the incident involving the launch of the U.S. Black Brant-12 research rocket from Andoya Island Rocket Range in Norway in January of 1995. Prominent U.S. experts believe that the information on preparations for the launch, which had been provided to the relevant Russian officials in a timely fashion, did not reach the corresponding services. As a consequence, the signal picked up on radar screens was interpreted as an incoming missile attack originating from a U.S. submarine. The information on a potential missile attack in progress was relayed up the chain of command. As a result, as Western analysts and mass media maintain, the "nuclear suitcase" was activated for the first time. Only several minutes before the retaliatory strike decision was supposed to be made did the Russian military command come to the conclusion that the missile did not constitute a threat.

We should also keep in mind that EWS is influenced by the so-called Type I and Type II errors, which are

interconnected through probabilistic relations. Type I error is a missed event, in our case, a missile launch by an adversary, while Type II error is a false alarm. The value of the "activation threshold" of the EWS system's sensors determines the probability of the former or the latter errors. Thus, a high sensitivity threshold of sensors will provide for a high degree of protection against false alarms, but at the same time will harbor the danger of the early warning system not reacting at some point to a real launch of adversary's missiles. On the other hand, lowering the sensitivity threshold, which could be typical of a crisis environment, will increase the probability of the system generating a false alarm. Naturally, in the latter case, the level of nervousness and suspicion between opposing nations will sharply increase, the strategic stability will decrease, and the risk of an accidental nuclear war will grow.

Such instability causes a situation in which, as Professor Paul Braken correctly stated, "no one wants war, but everyone would prefer to attack first in order not to be the second." Should something go wrong, a war, having crossed the "nuclear threshold," would develop in accordance with its own intrinsic laws marked by ultimate irrationality and high speed of escalation. In peacetime free from the burden of an escalating military confrontation, primary danger arises out of false alarms. This is precisely the conclusion which can be drawn from many failures and false alarms in the early missile warning systems.

The development of the military command system software is especially difficult, particularly from the point of view of the corresponding degree of reliability. The abundance and complexity of functional relations, the multitude and unpredictability of potential combat situations, as well as active counteraction on the part of the adversary highly complicate the structure and the volume of software programs. As the world experience demonstrates, even the most qualified of programmers are not fully warranted against bad mistakes. According to Holstead's theory, for large software programs the number of errors grows in proportion to their length logarithm (i.e. the number of lines of the programming code), thus making the idea of developing an error-free complex combat system command and control software program quite dubious. What all of the above means is that relying on such computerized systems can lead to tragic consequences due to their intrinsic lack of reliability.

To prove the above statement, a single example would suffice. During the conflict between Great Britain and Argentina over Falkland Islands (Islas Malvin), one of the best ships of the British fleet went down, the Sheffield destroyer, equipped with a state-of-the-art computerized air defense system. The investigation into the reasons of its demise revealed that during the development of the software program for the control of the ship's air defense system, the British programmers overlooked the recent addition to the Argentinian fleet of the French Exocet anti-ship missile. This particular missile is included in the arsenal of the NATO countries, and as such was registered as a "friendly type" missile in the air defense system control software of the British destroyer. As a result of this error, when the missile approached the ship, the devices for radio countering and destruction of airborne targets were not activated. The missile went through the air defense zone with no obstruction and with a direct hit sent the destroyer to the bottom of the ocean.

Over the decades of the Cold War, the military command of Russia had developed a strictly centralized (even more so than its U.S. counterpart, as some of the U.S. military experts admit) nuclear forces command and control system, with multiple redundancies. The high degree of reliability of this system has never been doubted. However, in recent years, the situation has become somewhat more complex in this area. First and foremost this has to do with the reduced amount of financing available for maintaining the technical reliability of the data gathering and surveillance systems and combat command and control

systems – a development which gives experts grounds for serious concern. Former Minister of Defense of Russia Igor Rodionov admitted to that effect by saying, “if lack of financial resources persists,… Russia could soon approach a threshold beyond which missiles and nuclear systems become unmanageable.” This state of affairs is a cause of great concern for the new Russian leadership. In particular, this was reflected in the program for the construction and development of the Russian Federation Armed Forces up to the year 2005, which, among other things, is focused on the task of maintaining and improving combat command, control and communications system. Extending launch preparation time appears to be the best solution to the problem of potential errors or false interpretation of EWS data.

Technical Faults And Failures Of Weapon Systems

There are many widely known instances of technical failures in the weapon systems and a large number of accidents involving nuclear weapons carriers: ships, planes and rockets, which have not resulted in a nuclear catastrophe yet by sheer luck. Below are a few examples in support of the above statement.

The demise of USS Thresher which went down in 1963, burying the entire crew and the weapons, marked the beginning of the nuclear weapons carriers’ accidents at sea. That incident was followed by a number of nuclear submarine accidents at sea. In 1968, a Soviet K-129 submarine carrying nuclear weapons on board went down in the Pacific Ocean. In 1980, a fire broke out on the Soviet Echo submarine. In June of 1983, as a result of a technical failure, USS Charlie carrying a nuclear load sank. In March of 1984, Soviet Victor submarine was severely damaged following a collision with Kitty Hawk aircraft carrier and had to be towed to base. In October of 1986, a Soviet Yankee-1 submarine caught on fire and went down, together with the 16 strategic missiles on board.

In April of 1989, Soviet submarine Komsomoletz sank in the Norwegian Sea as a result of fire that broke out on board. It carried nuclear-tipped torpedoes and cruise missiles. In June of 1989, there was an accident involving the primary power-supply unit of another submarine, also armed, among other things, with nuclear-tipped torpedoes and cruise missiles. The accident was successfully neutralized and the submarine was towed to Severomorsk. The most recent accident in this line was the sinking of the Kursk nuclear submarine which met its end in the Barents Sea as a result of the explosion of a weapon that it carried on board. It is hard to imagine what could have happened had the submarine carried cruise missiles or nuclear-tipped torpedoes, as had been the case with this kind of submarines prior to 1991. This incident makes us truly appreciate the far-sighted steps taken in the fall of 1991 by Presidents George Bush and Mikhail Gorbachev toward removing tactical nuclear weapons from surface vessels and submarines.

We know of a number of serious incidents involving missiles. For instance, in August of 1966, a liquid-fuel engine Titan-2 ICBM carrying a megaton-class warhead exploded in silo in the United States. The accident which occurred in September of 1980 at the airbase in Little Rock, Arkansas, took the lives of almost 50 military men, when the same missile exploded in its silo. The wave of the explosion threw the megaton-charge warhead out of the silo. In June of 1987, at the Wallop’s Island testing ground, Virginia, a lightning bolt caused the solid-fuel engines of the Orion missile and two smaller missiles to activate and self-launch. Incidents involving aircraft carriers of nuclear weapons are also part of the history (release of nuclear weapons, which fell together with the wrecked U.S. plane in the area of Palomares, Spain; crashing of a bomber carrying nuclear bombs near the coast of Greenland).

Widely publicized was the explosion in October of 1960 of one of the new Soviet missiles during its preparation for a test launch at the Baikonur testing ground. This accident took the lives of the Commander-in-Chief of the Soviet Strategic Rocket Forces, Artillery Head Marshall Mitrophan Nedelin and about one hundred combat crew men. In July of 1983, another missile carrier was the subject of a massive explosion at the same testing ground. Russia knows many cases of explosions of warheads in storage within its borders. Luckily, no nuclear warheads were kept at the same storage facilities.

One should admit with regret that in recent years, the problem of technical reliability of the strategic weapons systems included in the combat inventory has become worse. This has to do with the fact that a significant number of these systems have exhausted the warranty service life established by the designers and are subject to replacement with the new designs. However, due to lack of resources required for these purposes, the decision was made to carry service life extension work meant to keep several types of weapons in the combat inventory. Commander-in-Chief of the Strategic Rocket Forces General Vladimir Yakovlev admitted in 1998 that already at that time 62% of missile systems and 71% of command and control systems in the arsenal of the forces were beyond their warranty life spans. In order to extend the service life of missiles by one-and-a-half times, a complex of activities is carried out jointly with the industry, such as individual diagnostics of each missile, replacement of individuals units and assemblies, some further system improvements.

The situation with submarine missile carriers is not much better. Their established warranty service life of 25 years can be ensured only if they undergo average maintenance every 7-8 years. However, the state lacks the necessary resources to support these technical requirements, which causes an early retirement of submarines from combat inventory. At the same time, the problem of extending the service life of ballistic missiles carried on board of the submarines remains just as acute as in the case of the strategic rocket forces.

Despite the assurances of certain high-ranking military men concerning the high technical reliability of the strategic offensive arms systems, there is no doubt that the attempt to extend their warranty service life is a forced measure, taken out of necessity which *a priori* implies certain negative aspects. It is not a coincidence that U.S. Secretary of Defense Bill Perry while evaluating the potential threat of the Russian nuclear weapons, including the danger stemming from its lowered technical reliability, asserted that the best way to assure the safety of the United States is to help destroy the nuclear weapons of the former adversary.

The Role Of The Human Factor In Causing A War

The role of the human factor is very prominent in the fate of nuclear weapons. The accumulation of tremendous arsenals of nuclear weapons and the saturation of virtually all types of military forces with nuclear weapons has lead to the daily involvement of tens of thousands of military men in the servicing, transportation and safeguarding of nuclear weapons. In the mid-1980?s, more than 150,000 people had access to handling nuclear weapons in the United States army, air force and navy. The picture was more or less the same at the time in the U.S.S.R. military. Even though in Russia that number has significantly shrunk, it still involves tens of thousands of people with access to nuclear weapons throughout their life cycle. Despite the fairly strict selection and heightened psychological and physiological control, some of these men can suffer a nervous breakdown as a result of significant mental stress, with most severe consequences. The U.S. newspapers carried a story based on a real-life case involving an air force

sergeant who, suffering from a mental breakdown, “made a lame attempt to take his own life” by shooting from a pistol at a nuclear warhead.

It is not coincidental that the concern on the part of the United States with regard to Russian nuclear safety lead to the passing of the Nunn-Lugar Act, which calls for assistance to Russia in its efforts to eliminate weapons of mass destruction and to strengthen its nuclear safety. An example of this assistance is the supply of containers and special railcar equipment for the transportation of nuclear warheads, of protective covers, as well as several “lie detectors” and equipment sets used to determine which individuals are mentally unstable, as well as those prone to alcohol and drug abuse.

According to some experts, it is precisely the human factor that constitutes the weakest link in the nuclear safety assurance system. This problem is of particular urgency in Russia, where the deteriorating social and economic situation has significantly complicated the conditions of the military personnel. About 12,000 officers in the strategic rocket forces are on combat duty in underground command posts and on mobile missile systems, in the higher command and control centers. Several hundred Navy men serve their country in the ocean depths without coming to the surface for 2-3 months.

At the same time, the low wages of officers, lower-rank officers in particular, do not provide their families with the needed living standards, while poor housing conditions complicate the every-day life of officers. Currently, tens of thousands of officers do not have their own apartments. In these conditions, many young officers leave the army ranks soon after graduating from the military academies, while others look for ways to earn extra money on the side. Social and economic troubles in the country have worsened the attitude toward military service in general, weakened the discipline among rank-and-file military men, and lowered confidence in the precision of the performance of their direct duties, including the requirements to ensure nuclear safety and to prevent unauthorized actions. However, in the Russian Armed Forces only officers and non-commissioned officers have direct access to nuclear weapons in their line of duty, the majority of whom, due to the peculiarities of the Russian mindset, still approach the task of carrying out their military duties quite responsibly.

Instances of violations and crimes committed by regular service soldiers and sergeants, which end up widely publicized, testify to the need to improve the system of selection for special forces service and to maintain constant control over their moral and psychological condition. A case in point, for instance, we can cite the fact that in 1998 alone a number of serious incidents took place at nuclear facilities: one of the soldiers shot the guards at Mayak radio chemical plant; a sailor committed suicide on Vepr nuclear submarine (Northern fleet), having locked himself in the torpedo section; three soldiers captured hostages at Novaya Zemlya nuclear testing ground. The described incidents are testimony to the fact that the human factor problem is one of the primary issues as far as preventing nuclear weapons accidents is concerned. However, there can hardly be any doubt that this problem can be fully eliminated only in the conditions of an economic revival of Russia and a significant improvement of the social and economic conditions of the nation’s population. Only a simultaneous solution of international military and political and domestic social and economic problems will make it possible for us to count on reducing the risk of an accidental nuclear war to the minimal level.

Due to the exacerbation of the international terrorism problem, the socio-psychological factor is gaining importance. First of all, this has to do with the risk of terrorists gaining access to nuclear facilities granted by mentally unstable or financially needy personnel. Even though such fears have not been justified so

far, in light of the evolving situation, one should treat them with particular seriousness.

Inadequate, Erroneous Decision-Making By The Top Political Leaders

Experts in the area of complex systems notice a deep correlation between the probability of occurrence of erroneous or unauthorized actions involving nuclear weapons and the level of global stability and degree of military confrontation. During the periods of heightened military tensions between nuclear nations, the probability of an accidental nuclear war can increase due to inadequate evaluation of the situation and of the intentions of the potential adversary under stress, lowered sensitivity threshold of EWS sensors, mental stress of command and control post operators. The desire to unveil the plans of the opponent is influenced by so many fortuitous factors, stereotypes of times past, and the peculiar conformism of collective mentality that it is quite risky to talk about the adequacy of decision-making in such a situation.

As is rightfully mentioned by many researchers, in the final analysis, nuclear safety depends on people entrusted to make military decisions. In this, individuals often behave differently as part of working groups rather than acting on their own. This is particularly true of stressful situations, when they cease individual thinking in favor of the opinion of the leader or of a simple majority. The stressful environment which emerges when a missile launch signal (potentially false) is received is further aggravated by the very short missile flight time during which a decision must be made, as well as by the high degree of combat readiness of the national nuclear forces.

Decisions made at the top political level are of particular significance. The complexity and an extremely high level of responsibility for making a decision which could separate peace from war, creates an environment of acute stress for the leaders of nuclear nations. Approximate calculations and simulations of combat situations demonstrate that if a signal of an incoming nuclear strike by an adversary is received, the top political leadership of the defending country will have no more than 3-4 minutes to evaluate the situation and make the launch-on-warning decision. In conditions like this the probability of making erroneous decisions inadequate for the situation at hand dramatically increases.

The experience of the top political leaders of the United States and the U.S.S.R. attest to that. Former National Security Advisor to the President of the United States Brent Scowcroft gave a fairly picturesque description of the behavior of U.S. presidents during study sessions and discussions concerning nuclear forces management. “My experience shows that after the first couple of days, they are absolutely horrified when all of a sudden they realize that they are in charge of all this and they are the only ones who must make the decisions.”

The reaction of the former U.S.S.R. President Mikhail Gorbachev in a similar situation is just as emblematic. In an interview with a U.S. correspondent Jonathan Shell he reminisced, “When I was being taught how to use the “nuclear button” or the “black case,” the following situation was described to me: I could be notified of an attack from one direction, and while I am thinking of what to do next, the same minute another message comes in concerning a nuclear attack from another direction. And these are the conditions in which I have to make the decision.”

In an environment characterized by the emergence of new nuclear nations and proliferation throughout the world of delivery means of long-range weapons of mass destruction, the uncertainties faced by the top military and political leadership of the United States and Russia become even more pronounced. Thus, a

deliberate or accidental launch of an Indian, Pakistani or Israeli missile heading toward Russia can be interpreted as a launch of an American SLBM initiating in the Indian Ocean or the Mediterranean, while the flight trajectory of Chinese missiles heading toward targets located in North America partially crosses the Russian territory, which during a certain time creates uncertainty as to their real target.

Summarizing the review of the primary causes which promote an accidental nuclear catastrophe, one should point out that at the basis of them all is the high alert status of the strategic offensive arms. It is about time we understood – and turned that understanding into a practical plane – that given the new geo-strategic environment, it is hardly possible to assure a high level of strategic stability without radical nuclear weapons reductions and without de-alerting those which are retained in active inventory.

Weapons Reductions As The Main Direction Toward Increased Nuclear Safety

We believe that at the present time and in the observable future, practical steps on the road to nuclear arms reduction will have the most influence on increasing safety and on preventing inadvertent or unauthorized missile launches. The understanding of the reality of a nuclear war threat despite the will of the political leadership of the U.S.S.R. and the U.S.A. had lead to the start of negotiations as early as in the second half of 1960?s concerning the limitation of the nuclear arms race and reduction of nuclear arsenals. The signing of the Interim Agreement On The Limitation Of Strategic Offensive Arms (SALT I) in 1972 served as the first step in that direction. In 1979, the Strategic Arms Limitation Treaty (SALT II) was signed, but was never put into effect.

The signing and implementation of the U.S.-Soviet Treaty On The Elimination Of Intermediate-Range And Shorter-Range Missiles (INF) played an important role in terms of strengthening the strategic stability and averting an accidental conflict.

In July of 1991, START I Treaty was signed in Moscow, providing, for the first time in history, for deep cuts in the strategic nuclear forces: from the level of 10,500 to the level of 6,000 warheads on strategic carriers, not to exceed 4,900 on ICBM and SLBM, with the overall number of carriers not to exceed 1,600. Everyone had big hopes for START II in that regard, which was signed in January of 1993, providing for a reduction in the number of warheads on carriers to the levels of no more than 3,000 – 3,500, with under 1,750 of the warheads on missiles carried by submarines, and for the elimination of the destabilizing MIRVed ICBMs, the main component of the preventive and launch-on-warning strikes. The U.S. Senate ratified the Treaty in 1996; Russia ratified START II as part of the New York package in 2000. The legal conflict which emerged as a result has not been resolved yet. The United States does not plan on ratifying the 1997 New York agreements, and START II cannot come into force without this ratification. Also unclear is further fate of the bilateral Russian-American dialog on strategic nuclear forces reduction.

Implementing the proposal put forth by President Vladimir Putin concerning further reductions in strategic offensive arms down to the levels of 1,500 warheads would promote an even greater strategic stability and a significant decrease of the threat of emergence of any “non-standard” situations. However, a reduction by itself, without any additional agreed-upon measures to strengthen the strategic stability, will not necessarily result in a lower nuclear threat level.

De-Alerting Nuclear Weapons

When considering the problem of averting an accidental nuclear conflict, one should admit that the risk of the emergence of such a conflict can be totally eliminated only if there is a total ban on nuclear weapons combined with the destruction of their entire stockpiles under strict international monitoring. However, in the nearest future, mankind will not be able to fully shed the nuclear threat potential once and for all. This means that the world community must assure the highest possible degree of safety of nuclear weapons. One of the main directions on this path consists of de-alerting both strategic and tactical nuclear weapons. Although Russia (U.S.S.R.) and the United States have been discussing this issue at various levels for almost thirty years now, we have to admit that in the area of strategic nuclear forces de-alerting, only the very first steps have been made so far.

The initiative taken by President George Bush in September of 1991 served as a very positive example of implementing the thesis on the need to de-alert strategic offensive arms. He ordered to fully de-alert several dozen heavy bombers which prior to that step had been on hair-trigger alert for decades, ready for takeoff within several minutes in response to an early warning system signal. At the same time, he ordered to de-alert 450 Minuteman-2 strategic missiles and Poseidon SLBMs on 10 submarine missile carriers. However, most impressive was his commitment concerning deep cuts, up to the complete elimination of individual types, in the arsenal of the most prevalent of nuclear weapons: tactical. He announced the plans of the United States to move to its territory all the artillery shells and tactical warheads so that they could be destroyed, and to remove all tactical nuclear weapons from surface ships, multipurpose submarines as well as ground-based naval aviation, while maintaining an effective air-based nuclear potential in Europe (500 air bombs with a total charge of 96 Mt). [4]

As a response to the Bush initiative, President Mikhail Gorbachev ordered to de-alert over 150 ICBMs in silos and 6 missile carrying submarines, to lower the alert levels of heavy bombers, and to maintain rail-based combat-ready missile systems in a stationary configuration in places of their permanent deployment. He also undertook reciprocal steps aimed at the reduction, partial elimination and radical de-alerting of tactical nuclear weapons by virtually “mirroring” the initiative of George Bush. Later on, Russian President Boris Yeltsin confirmed these plans and filled them with specific content in the Statement On The Russian Policy Concerning Arms Limitation And Reduction. Soon afterward the schedule of partial and complete elimination of various types of tactical nuclear weapons was announced, which provided for their dismantling by the year 2000, inclusive.

Virtually all potential threats point to a particular need to de-alert nuclear weapons, especially from the viewpoint of preventing an accidental nuclear war. The potential range of practical steps aimed at nuclear de-alerting is quite broad and varied and includes measures ranging from mutual de-targeting of strategic offensive arms all the way up to the removal of nuclear warheads from all delivery vehicles. [5] The main purpose of de-alerting is to eliminate the threat of an accidental nuclear conflict by allowing the top leadership of nuclear nations sufficient time to perform a comprehensive evaluation of the situation at hand and therefore to make adequate decisions.

The solutions of the organizational and technical nature aimed at de-alerting differ from each other by the three main parameters, namely:

- the time it takes to re-alert;
- the possibility of mutual verification; and
- the cost of de-alerting and re-alerting.

The agreement between Russia and the United States on mutual de-targeting signed in 1994 served as the first step toward de-alerting. Later on similar agreements were signed between Russia and other nuclear states. However, one should admit that this step was more political than military in its significance, since on the one hand, it is not verifiable, and on the other hand, only 1-2 minutes are required to re-target the missiles. [6]

At the same time we should keep in mind that alert levels are quite sensitive to the changes in the foreign political situation, crises in particular. Despite the lessons of the Cuban missile crisis, such examples happened on later dates as well. When in 1968 Soviet troops marched into Czechoslovakia, the leaders in Moscow, fearful of potential actions on the part of NATO and the United States, ordered to put the strategic rocket forces on heightened alert. During the Arab-Israeli 1973 armed conflict, similar actions aimed at increasing the alert levels of nuclear forces were taken by the United States. Later we found out that during this event combat crew commanders had retrieved the envelopes containing launch keys and presidential codes – an act which in an of itself increased the probability of an unauthorized or accidental missile launch.

Both the tactical aspect and sequence of actions aimed at de-alerting strategic arms should be carefully thought through. This means that in the beginning it makes sense to use simpler de-alerting procedures which would provide for non-burdening levels of the main parameters: a relatively short re-alerting time (should it become necessary to re-alert); possibility of verification; and acceptable financial costs. As the transparency and mutual trust increase, deeper levels of de-alerting could gradually be achieved.

It would be expedient to start the movement in this direction with de-alerting the most dangerous, from the point of view of accidental or unauthorized actions, ground-based missiles which are maintained daily on the highest, hair-trigger alert in their complete configuration. In the beginning, the degree of their combat readiness could be lowered through the removal from missiles of individual assemblies and units, such as on-board power supply, shroud, silo cover blocking system, etc. Then, later on, we could switch to deeper de-alerting measures, all the way to the removal of warheads from the missiles and their storage in specialized off-site facilities, away from launch pads.

In order to verify the technical status of a missile in silo it is necessary to replace its nuclear warhead with an electronic simulator – an action which by itself would require significant financial resources. In this, one has to remember that the removal of warheads form delivery vehicles followed by their safe storage is possible only in the conditions of deep strategic arms cuts. As Deputy Chairman of the State Duma Defense Committee Alexei Arbatov rightly points out, “if an attempt is made to implement the de-alerting concept by way of warhead removal prior to eliminating the tremendous arsenals of nuclear weapons, the issues related to the safety of their storage, transportation and recycling could become insurmountable.” This confirms yet another time the need to achieve far-going reductions in nuclear arsenals which, by decreasing the direct threat of a nuclear conflict, open up the road toward the implementation of a cardinal solution of the strategic offensive arms de-alerting problem.

De-alerting ballistic missiles carried by submarines (SLBMs) could prove to be a more difficult task. In

addition to high financial costs, such an operation would raise doubts as to the preservation of this component within the nuclear triad. Cruiser patrol with missiles but without warheads mounted on the missiles makes no sense whatsoever. The same submarines, while in base, lose their main combat function, that of survivability, and become quite an attractive target, not only for nuclear weapons, but for conventional weapons as well. The process of restoring combat readiness of SLBMs would take a significantly long time, measured in weeks. Therefore the issue of de-alerting SLBMs seems to be the most complex out of all the strategic offensive armaments. Most likely, the initial steps will involve a partial removal of warheads from SLBMs and the search for and coordination of a number of organizational and technical measures which would assure a sufficient time margin necessary for the crew to launch a missile in response to the launch command.

De-alerting heavy bombers equipped with nuclear weapons would have relatively little influence on decreasing the threat of accidental or unauthorized actions potentially resulting in a nuclear catastrophe, the reason lying, first and foremost, in their lower combat readiness compared to missiles, and also in their flight time preceding the launch of cruise missiles from their board, which is quite long. During that time, a command can be given to cancel the order to engage in combat and to return the heavy bomber to its base. At the same time, it is quite difficult to verify the alert status of heavy bombers. For instance, they can be loaded with tactical nuclear munitions which are not subject to the prohibitions under the strategic arms limitation treaties and they can be stored at the same airfields.

The role and significance of the air component of the nuclear triad may grow substantially if nuclear weapons are removed from all strategic arms. In that case, the time required to re-alert heavy bombers will be the shortest out of all the strategic offensive arms. In a situation like that, the role and significance of heavy bombers in terms of delivering a massive first strike on the opponent could dramatically increase, particularly for the side which possesses a superiority in the air component of the triad.

De-alerting strategic offensive arms in effect means their transfer to the so-called “return potential”, or reversibility category, which, as evidenced by the course of discussions of this issue within the START II framework, is a particularly sensitive issue for Russia. The situation is further aggravated by the fact that the existing asymmetry of the composition and structure of the strategic nuclear forces of both sides dictates the need to search for reasonable compromise on issues concerning de-alerting the various components of the nuclear triad.

A number of esteemed U.S. experts (B. Blair, G. Favison, F. von Hippel) believe that it is expedient for the United States to be the first to de-alert its missiles, thus giving a signal to Russia to follow suit. They propose to take off alert first-strike weapons, such as 50 Peacekeeper missiles, carrying 500 high-precision high-charge warheads and 400 similar Trident-2 W-88 SLBMs warheads. As a second step along this road, they recommend that all ground-launched missiles (500 Minuteman-3 missiles) be deactivated in a similar fashion, the number of deployed missile-carrying submarines be cut by half and the number of warheads on each SLBM be reduced from 8 to 4. At the same time, they consider it necessary to provide for a change in missile launch preparation operations so that the crew of the submarine would need at least 24 hours to accomplish that task.

They count on Russia to respond to the U.S. initiative by taking similar steps, just as it happened with the statements by the leaders of the two nations in September-October of 1991. The authors of these proposals believe that the indicated measures, if undertaken by both sides, will significantly lower the

threat of an accidental nuclear conflict. At the same time, the remaining combat-ready retaliatory means which possess a high degree of survivability (i.e. being able to survive a first nuclear strike by the opponent) will ensure the strategic stability at the level of minimum nuclear deterrence required to disrupt the attack of any potential aggressor.

If both sides undertake the indicated steps, their capabilities of delivering the first strike will significantly decrease while the launch-on-warning probability will be materially limited. At the same time, the political leadership of Russia and the United States can decide to maintain a certain portion of their strategic forces on full alert temporarily, until the other nuclear nations follow suit. The final goal should be de-alerting all ground-launched and sea-launched missiles which are maintained on constant alert, under mutual verification arrangements which have been provided for by arms limitation agreements already in place and by those which may be concluded in the future. The main goal of the verification should be the assuredness that no nuclear state is taking clandestine steps to increase the alert levels of its strategic forces.

The risk of an erroneous evaluation of the situation brought about by an accidental missile launch can be lowered through the use of a direct line of communications between Moscow and Washington, introduced in 1963 under the influence of the Cuban missile crisis. In 1971, U.S.S.R. and USA signed an Agreement On Measures To Reduce The Nuclear War Threat. The agreement delineated the actions of each side in the event of an inadvertent missile launch. It contains the requirements to the actions by the side who is the owner of the launched missile regarding its neutralization and destruction before it causes any kind of damage. Shortly after that Deputy Minister Victor Karpov made a statement that in the Soviet Union, all ICBMs had been equipped with self-destruct devices allowing to destroy the missile after it had been launched from the ground in respond to the command.

The present situation is more favorable now than before in terms of taking practical steps toward de-alerting the strategic offensive forces. At the U.S.-Russian presidential summits, first in Ljubljana and then in Genoa, the problems of strategic stability were discussed in a new format which provides for the consideration of both offensive and defensive components of stability in one package (START/ABM). It is hardly possible to consider the status and the potential of strengthening strategic stability without giving due account to the influence exerted on it by the high alert status of strategic offensive arms and by the de-alerting measures. There is no doubt that Russia and the United States, as two nuclear superpowers, must take the initiative and make the first steps toward real de-alerting. Only then will it become possible to cause other nuclear nations to undertake the commitment not to maintain or put their nuclear forces on high alert.

The issue of de-alerting strategic offensive armaments must soon be looked at in the practical realm, pursuant to earlier agreements. During the summit in Helsinki in March of 1997, the presidents of Russia and the United States agreed “to de-activate, by December 31, 2003, all strategic carriers of nuclear weapons subject to elimination under START II, by way of detaching their nuclear warheads and by taking other mutually agreed-upon steps.” Despite the fact that this agreement is not legally binding until START II Treaty actually comes into effect, decisions like this give us hope that Russia and the United States are determined to gradually de-alert their respective strategic offensive arms thus strengthening the strategic stability and helping prevent an accidental nuclear conflict. In the solution of this problem the leadership of the two countries will undoubtedly lean on the world community for support.

Nuclear Weapons and NATO Expansion

Russia meets NATO expansion with concern and lack of understanding. Certain Russian politicians and parliamentarians perceive of NATO policy as openly hostile toward Russia, and accuse the United States and NATO of breaking their gentleman agreements of the late 1980-s, when the Soviet Union withdrew its troops from Eastern Europe and the Warsaw Treaty Organization was disbanded, while the U.S.S.R. obtained assurances of “non-proliferation” of the NATO military structure to the East. At the diplomacy level, Moscow has repeatedly stated that acceptance of new members into the NATO alliance only creates new watersheds in Europe and does not promote security, stability or trust either at the continent or in the world. Russia’s attitude is particularly negative in what concerns the prospects of accepting former republics of the Soviet Union into the Alliance.

The spring of 1999 witnessed NATO expansion by way of inclusion in the alliance of the “first wave” countries, such as Poland, Hungary and Czec Republic, which presented the greatest military and strategic interest in terms of war plans with anti-Russia orientation. As a result, the operational range of the alliance increased by 650-700 km. NATO gained access to approximately 290 airfields, most of which could become bases for combat aviation; up to 500 deployed military warehouses; a branched-out network of motor roads and railroads providing for a fast relocation and deployment of troops. Combat aviation gained the capability to hit targets located in the European part of Russia, up to the Grozny-Sratov-Kotlas-Arkhangelsk line. NATO expansion against the backdrop of the implementation of the Conventional Arms Limitations Treaty in Europe resulted in approximately a 3:1 force correlation between NATO and Russia.

Many an expert in Russia believes that in such an environment Russia is forced to accentuate its nuclear capabilities. Experts also note the lowering of the nuclear use threshold, which is reflected in the military doctrine of Russia. It is quite indicative that Russia held in April of 1999 a meeting of the Russian Federation Security Council chaired by the President of Russia which considered the issues of the nuclear weapons complex. Among issues that were discussed at the meeting significant attention was paid to the concept of development and combat utilization of tactical nuclear weapons as an effective means of equalizing the capabilities of both sides and of assuring the national security of Russia.

Even though 2000-01 witnessed a significant improvement in the relations between Russia and the West, NATO included, it remains unclear to what degree the latter is ready in reality to take into account the security interests of the Russian Federation. Obviously, the continuation of the Western policy of the 1990?s, which was interpreted in Moscow as that of ignoring Russia’s interests, cannot lead to greater confidence building and, therefore, will negatively affect the entire spectrum of the military and political relations, including the control over the strategic nuclear forces and the prospects of their de-alerting.

Influence Of Missile Defenses Deployment On The Alert Levels Of Strategic Offensive Arms

As we all know, strategic offensive and defensive arms are closely connected and form a single system of strategic armaments. It is not coincidental that SALT I Treaty and ABM Treaty were signed on one and the same day, May 26, 1972.

Russia believes that the ABM Treaty has served as the “cornerstone of strategic stability” for thirty years, promoting the cessation of the arms race and the strengthening of strategic stability. Its military and strategic meaning boils down to the fact that in absence of an area missile defense system, an aggressor nation becomes vulnerable to a retaliatory strike, even a weak one, by the country which had become the victim of attack. This means the realization of the fact that there will be no winners in a nuclear war: “whoever shoots first will inevitably die second.” This is precisely the concept on which mutual nuclear deterrence is based, which lies at the heart of strategic stability.

The United States explains its intention to deploy national missile defense system by the existence of a missile attack threat emanating from certain countries, as well as the potential of an inadvertent or unauthorized launch.

As of late, there has been talk in the United States concerning the development of a so-called “limited” National ABM (NABM) system, which, as the U.S. Administration maintains, should pose no threat to Russia. However, even a limited NABM system will include the following three key components:

- reconnaissance and data gathering system;
- combat command, control and communications system; and
- interception capabilities.

Since the talk is about the development of a system to protect against limited strikes across the entire U.S. territory, the first two components must cover all 50 states. The only component to be limited is the number of means of interception, which can be increased manifold within a short period of time. In practice this means that under the screen of a so-called “limited” ABM system the U.S. will be developing the BASIS for a large-scale ABM system to cover its entire territory, which is prohibited by Article 1 of the ABM Treaty. Therefore there are grounds to believe, which Russia does, that the future ABM system will in effect have an anti-Russian and anti-Chinese foundation.

The ABM problem should be reflected in the consultations which have commenced between Russian and American experts and political leaders on the search for a compromise in the discussion of strategic stability issues in connection with START/ABM as a single system. According to Alexei Arbatov, “if Washington agrees to sign a new START treaty acceptable to Moscow, a number of amendments can be made to the ABM Treaty, which would allow to engage in more diverse testing of anti-missile systems and components. The issue of their deployment could be the topic of special future negotiations, depending on the evaluation of threats and technology development.”

If the decision to deploy national missile defense system is made by the United States, Russia could take reciprocal measures. In the opinion of military experts, these measures will most likely be asymmetrical in nature and will follow three main directions:

- improvement of national strategic offensive forces aimed at increasing their ability to beat the prospective ABM system;
- search for new methods of combat employment of strategic offensive arms; and
- preparation to engage in active combat against the most vulnerable components of the ABM system, for the purposes of its neutralization.

Evidently, preparations for countering an ABM system will include, among a whole line of specific measures, the activities aimed at maintaining Russian strategic offensive arms on constant alert, since in this case Russia will be forced to an even greater degree of dependence on the launch-on-warning strike. These forced measures will in no way promote higher nuclear security and elimination of the potential threat of an accidental nuclear conflict.

Summary Conclusions and Recommendations

1. The process of globalization taking over the world, which is gaining more and more momentum in such spheres as the economy, information technologies, high-tech, etc., is extending to the sphere of military security as well. This legitimately results in a higher degree of dependence of the state of national security of each individual country on the level of strategic stability in the world. As President Vladimir Putin pointed out, there is no country that can build a safe world for its own sake, let alone to the detriment of others.
2. What's needed is a constructive dialog in search of mutually acceptable solutions. Russia and the United States must, first of all, achieve results during the consultations on the strategic stability issues within the START/ABM framework, keeping in mind the need to prevent a new round of the arms race and to reduce the accumulated arsenals to the level of reasonable necessity. While holding the negotiations in the START/ABM format, it is necessary to agree on the main military and doctrinal points, ensuring, among other things, the abandonment of the nuclear launch-on-warning posture as one of the main threats of unleashing an accidental nuclear conflict.
3. Only if we abandon the concept of maintaining our nuclear forces on constant alert do we have a real chance of reducing the probability of an accidental nuclear war. De-alerting measures could be discussed and adopted in parallel to the START/ABM and strategic arms limitations consultations. Unilateral, step-by-step measures are also possible, followed by discussion and augmented by confidence-building measures. At the same time, we should keep in mind that in the reality of huge existing arsenals, de-alerting, if performed by way of removing warheads from delivery vehicles, can become quite a complex task due to financial and technical considerations related to storage, transportation and recycling of removed warheads.
4. Steps to de-alert Russian and U.S. SNF could give a new impetus to the Russian-American dialog concerning the new format of strategic relations between the two countries. In particular, Russia could consider the possibility of de-alerting ahead of time a portion of ICBMs which were slated for destruction under START II Treaty, even if this document never becomes effective. The United States, in its turn, could reduce the number of its SSBNs maintained on constant combat patrol. The parties could also consider the possibility of de-alerting their respective SLBMs deployed on submarines kept in base. If the political relations improve, Russia and the United States could take farther-reaching measures, making other nuclear nations join them in these endeavors.
5. One should keep in mind that the alert level of strategic nuclear forces and the resulting probability of an accidental nuclear conflict are in direct dependence on the state of relations between the nuclear powers. This means that by taking unfriendly steps toward Russia, such as eastward expansion of NATO and unilateral withdrawal from the ABM Treaty on the part of the United States, will stand in the way of de-alerting the strategic and tactical nuclear arms.
6. In the conditions of the current complex and dynamic international situation, a significant role in the search for ways of preventing armed conflicts is played by non-governmental and public organizations, the activities of which are free from any commitments and allow to conduct broad

research and to search for non-trivial ways of maintaining strategic stability. It is possible to begin discussions at the expert level on the probable ways to de-alert strategic nuclear forces and to institute mutual verification arrangements over the implementation of the existing commitments of Russia and the United States in what concerns efforts to de-alert tactical nuclear weapons.

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Notes:

1. Even if a small portion of the nuclear weapons maintained on high alert is used, it will cause a long-term change in the planetary climate, a so-called “nuclear winter”, and the extinction of the humankind. In 1983, American astrophysicist Carl Sagan published the results of research on the consequences of a potential nuclear war in the aftermath of the use of weapons with the overall charge of 5,000 Mt, which at the time constituted approximately 12% of the overall stockpile. He demonstrated that thick clouds of soot will rise over the demolished cities and burnt soil, and a total darkness will descend on Earth, while the temperature of the planet’s surface will drop sharply. Air currents would then carry these clouds to the various regions of the entire globe. The results of these studies were used by Soviet scientists in the evaluation of the potential consequences of a hypothetical “nuclear winter.” Simulation of that situation showed that already in the first weeks following the initial large-scale utilization of nuclear weapons, mean temperatures in the Northern hemisphere will fall by 15-20oC, and by 30, or even 40 degrees in some regions. By the beginning of the second month, the soot clouds would totally envelope the Earth. This would lead to the absorption by the upper layers of the atmosphere of the majority of the sun’s energy which would result in their heating up to 100 degrees, while the temperature would settle at a below-zero level at the Earth’s surface for a long time. Later, these computations were further developed, showing that a “nuclear winter” would occur following the use of nuclear weapons with as little as 100-150 Mt of overall charge. (According to SIPRI data, one MX missile can carry 10 warheads with the overall charge of 3 Mt. One SS-18 missile can carry 10 warheads with the overall charge of 5.5 – 7.5 Mt). Even the destruction of the World Trade Center in new

York as a result of the September 11 terrorist attack – and let us keep in mind that the scale of the damage was significantly smaller compared to the use of a potent nuclear weapon – lead to the formation of a stable mass of suspended small-particle dust and emergence of a pronounced smell, which made it virtually impossible to continue living in the neighborhoods located within the radius of up to 1 km from the epicenter within 2-3 weeks. ? Return

2. Some experts classify SLBMs of Britain and France as forces maintained on high alert. ? Return
3. GUUAM – Georgia, Ukraine, Uzbekistan, Azerbaijan, Moldova ? Return
4. By Western estimates, currently there still remain about 150 U.S. nuclear air bombs in storage in Europe and Turkey. ? Return
5. The re-targeting procedure does not increase the launch preparation time, but nevertheless is looked upon as a confidence building measure. ? Return
6. Some experts believe that this procedure takes no more than a few seconds. ? Return