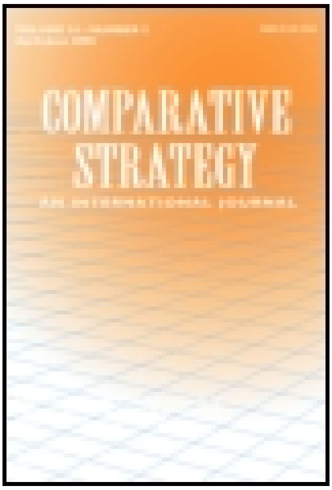

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The Russian Image of Future War

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Like its Soviet predecessor, the Russian military perceives the concept of a military-technical revolution (MTR) as the nucleus of future warfare. Emerging technologies are radically changing military capabilities and altering the character of warfare. The main efforts in future armed combat will be concentrated on the vertical or aerospace coordinate, and efforts on the ground will have a supporting role. Emphasis will be on destroying the enemy's most important military and economic facilities and counterattack assets, thus sapping its political will. Russian military scientists view nontraditional weapons and third-generation nuclear weapons as key elements of the MTR.

Many Western analysts assume that during the next 15 years, only the United States will have the capability to implement the new revolution in military affairs—that only the U.S. military will be able to integrate all of its elements into a cohesive whole. The question of what specific aspects of this new military-technical revolution other nations might obtain, when they might do so, and what implications this would hold for U.S. forces is an important one. As a result, U.S. policymakers can only benefit from analyzing the long-term vision of military powers such as Russia.

In the early 1980s, the Soviet military was perhaps the first to argue that a new revolution was occurring in military affairs. This military-technical revolution (MTR) was said to be generated especially by the emergence of non-nuclear deep-strike systems and electronic and information warfare assets that would revolutionize all aspects of military art and force structure. Like its Soviet predecessor, the Russian military views the MTR as the nucleus of future warfare. As the prototype of the new air-space war, Desert Storm is said to have confirmed earlier Soviet predictions regarding the advent of the MTR, and serves as the paradigm of future war in strategy, operational art, and tactics.

Western analysts have long respected Russian military scientists for their prescient contributions to military theory and practice. The Russians are also good imitators, who on occasion have surpassed those they imitate. Both are good reasons to continuously examine their military art. In addition, the most creative surges of Russian (and Soviet) military thinking have followed political or military disasters, a reminder that a prudent interest in Russian military affairs is never passé.

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The Russian Image of Future War

Russian military leaders continue to articulate a spectrum of threats that varies little from that of their Soviet predecessors. First, the United States is said to be modernizing its nuclear arsenal in order to implement a counter-force strategy. Second, Russian military scientists argue that only two changes have occurred in NATO strategy: (a) a CFE-imposed shift in focus away from the central front and toward the northern and southern TVDs, and (b) a revitalization of the flexible-response strategy in order to counter the growing probability of low-intensity conflicts. Third, the military continues to charge the West with superiority in conventional forces and an ongoing lead in emerging technologies (E.T.). Fourth, the predominant geostrategic threat is said to be China, against whose "multimillion-man" army the Russians plan to employ tactical nuclear weapons. Finally, military experts warn of the territorial ambitions of the Islamic states, and the nuclear potential of about 24 additional states by the year 2000.

Russian military scientists have described key "military-strategic factors" that would influence the post-Soviet image of future war [1]. First, membership in the nuclear club continues to expand. Second, the military conflict in the Persian Gulf highlighted new features of contemporary regional wars and the desire to destroy the enemy's economic base. A new class of targets emerged, ecologically dangerous production and raw material extraction enterprises. Third, there is a growing role for conventional precision long-range weapons, including those deployed on ships and aircraft of the navy, for whose employment there will be no need to request the consent of allies in military-political blocs. Because of this the center of concentration for both nuclear and conventional arms will be in the World Ocean, and the danger of war from maritime sectors will increase. Finally, the role of all command-and-control and support systems (intelligence, communications, combat, technical, logistic, and so forth) is intensifying.

According to General-Major V. Slipchenko, head of the Russian Scientific-Research Department of the General Staff Academy, warfare has evolved through at least five generations. The impending sixth generation of warfare, with its centerpiece of superior data processing to support smart weaponry, will radically change military capabilities and, once again, alter the character of warfare. Future wars will see smart conventional weapons destroying precisely located targets and limiting casualties while defeating the enemy militarily and politically with, in most cases, no need to occupy enemy territory. Military operations will be spacebased with greatly expanded command and control, electronic and air defense warfare, automated data communications, and reconnaissance capabilities. Though the employment of nuclear weapons is receding as we move toward sixth-generation warfare, their complete elimination is inadvisable at this time [2].

Slipchenko notes that during the next 10 or 12 years significant armament and military equipment developments are expected that will lead to radical changes in the character of war. As the newest precision weapons under development and testing enter the inventory, there also will be changes in the structure of armed forces and the forms and methods of their employment. In addition, the development of other types of armaments will continue. Entering the inventory by the turn of the century will be directed-energy weapons, automatic and automated high-precision weapons systems, more powerful explosives, deep-penetration ammunition and, of course, super high-speed data processing and electronic warfare equipment.

Space will become a new theater of military operations, even as the superpowers significantly reduce offensive nuclear weapons and replace them with conventional offensive strategic armament. Large ground force operations and nuclear missiles will recede, gradually being replaced by high-precision conventional weapons.

Sixth-generation warfare has thus changed the laws of armed combat and the principles of military art. It has changed the very coordinates of war. In wars of past generations, the main efforts of the warring sides were confined to the earth's surface, the width and depth of the offense or defense; the vertical coordinate (primarily air) was auxiliary or only supporting. But in future wars, this emphasis will be reversed. Future armed combat will be concentrated on the vertical or aerospace coordinate, and efforts on the ground will become supporting.

Past wars relied on ground forces to achieve victory by routing the enemy's armed forces and destroying its economic potential and political system. This kind of warfare involved extensive casualties and required occupation. Future wars generally will not require occupation. It will be enough to use non-nuclear strategic offensive weapons to inflict serious losses on the enemy's most important military and economic facilities and counterattack assets; its political system will disintegrate on its own. As the role of ground forces recedes into the background, the spotlight will focus on the air force, navy, air defense, and electronic warfare.

In early 1993, Defense Minister P. Grachev thus argued that "if a war begins, it will be with an *air-space offensive operation by both sides*. Strikes on the main facilities and troops will be made from space and from the air" [3]. He warned that the first facilities to be hit will be nuclear power plants, chemical plants, dams, and hydroelectric centers. Even without nuclear weapons, a nuclear-chemical war will thus begin due to zones of flooding, radiation, and chemical contamination. In such a war, there will be no front.

Russian Views On Future Trends

In analyzing the destructive properties of various types of weapons, Russian military scientists note that despite their diversity, the effect of weapons on targets is determined primarily by three basic forms of energy: physical, chemical, and biological. Depending on the forms of destructive energy, it is possible to define the kinds of weapons being used at present (or those that may appear in the future), the means of protection, and the kinds of warfare equivalent to them [4].

Based on the forms of energy used, it is possible to single out mechanical (kinetic), acoustic, electromagnetic, radiation, and thermal kinds of destruction. Inasmuch as there are properties common to acoustic, electromagnetic, and partially radiation kinds of destruction that are of a radiated (wave) nature, they can be consolidated into one classification conditionally called *radiated destruction*. The energy not of substances but of physical fields is at issue here in contrast to mechanical (kinetic) means of destruction. The effects of this radiated energy on electronics, weapons, military equipment, targets, and people, as well as protection against radiated destruction, can be called *radiated warfare*.

Contemporary armed forces chiefly employ weapons that act by kinetic, nuclear, and thermal energy. Even now means of radiated destruction (laser, radio-frequency, accelerator, infrasonic) that possess significant destructive capabilities and essentially instantaneous action are beginning to enter the inventory (Table 1).

Table 1
Means of Radiated Destruction

Kinds of Casualty and Damage Effect (Destruction)	Kinds of Means of Destruction (Weapons)	Nature of Casualty and Damage Effect on Targets
Acoustic	Infrasonic weapons; acoustic generators; explosions generating (forming) acoustic energy; means of acoustic (sonar) suppression	Functional and structural disturbances in living organisms and demoralization or death of people; suppression of operation or disabling of acoustic equipment, diversion from targets of weapons guided by acoustic (sonar) means; destruction of earth's ozonosphere
Electromagnetic	Laser and radio-frequency weapons; nuclear weapons (electromagnetic pulse); means of electromagnetic suppression	Destruction of cells of living organisms; charring, partial fusion, or vaporization of surface of objects; structural changes of equipment materials; suppression of operation or disabling of electronics and of electrical and optical devices; effect on minds, behavior, and reproductive function of humans
Radiation	Particle-beam weapons; nuclear weapons (ionizing); elementary particle accelerators; nuclear power plants; radiological weapons; radioactive substances	Ionization, structural changes (destruction), other disturbances of physical and chemical processes in organisms, military equipment materials, structures, and environment; radiation sickness; genetic changes in populations

Russian Views On Nontraditional Weapons

Like their Soviet predecessors, Russian military scientists view nontraditional weapons as the next stage in the ongoing MTR. They continue to examine the roles of air-, sea-, and space-based directed-energy weapons, as well as the role of systems termed non-lethal in the West.

Russian experts thus agree that a laser weapon is not a dead-end direction in the development of new military technologies. The laser has been used in other areas of the military-industrial complex for creating considerably more practical jamming systems (e.g., combat positions were illuminated by a laser, and a blinding sun appeared before the eyes of everyone who had optical devices) [5]. During the Persian Gulf War the United States demonstrated how lasers can be used in precision weapons. Laser guidance to a target ensures almost a 100% hit.

According to prominent military scientists, another promising direction is the electronization of military operations that comes with the increasing introduction of various electronic (radio-electronic) devices and instruments to modern weapon systems and to tactical and operational support means [6]. Electronic countermeasures, reconnaissance, and electro-optical weapons guidance are becoming new elements of the battle and operation. In the future it is expected that electronic weapons with a direct damaging effect (which a number of foreign specialists consider "absolute") will be introduced to the troops. The most success in this area has been achieved in the United States, where at present several models of a tactical laser weapon have been created and are being tested. Electronic weapons facilitate another form of battle, electronic-beam battle, which will be characterized by a transient nature, high accuracy of strikes on targets, instantaneous nature of damage effect, and impossibility of maneuver to get out from under a strike by a beam weapon.

Russian experts also focus on the following types of so-called nonlethal weapons.

Laser weapons. Laser equipment for disabling organs of vision has already been developed in the United States and can be adopted in the near future. In addition to these weapons, the United States and other foreign countries are creating high-power air-borne, shipboard, and ground laser units intended for disabling electro-optical gear. The main problem in developing weapons based on laser equipment that causes only temporary blinding is the wide range of change in radiation energy. Damage can be reversible or irreversible with the same amount of energy depending on the angle of sight, degree of the eye's adaptation to illumination conditions, and protection of organs of vision.

Incoherent light sources. Bright sources of blinking, incoherent light can cause temporary blinding and hamper aiming and movement over terrain. With certain values of pulse frequency and relative pulse duration, the sense of well-being deteriorates sharply and phenomena are observed that usually precede epileptic attacks. This effect increases when coherent light sources (for blinding) and incoherent ones (for disorientation) are combined with other kinds of nonlethal weapons.

Super-High-Frequency (SHF) weapons. SHF emission on the human body can be divided arbitrarily into energy and information mechanisms. The thermal effect of relatively large SHF emission power fluxes has been studied the most. Depending on frequency and power, radio frequency emissions can disturb brain and central nervous system operation, temporarily disable, cause a feeling of noise and whistling that is difficult to endure, and fatally damage internal organs. Some foreign experts believe that creation of these nonlethal weapons is problematic because of difficulty in obtaining requisite outputs with acceptable dimensions and unit cost, and the short effective range.

SHF generators can be used to disable electronic gear, though there are relatively simple protective measures. Foreign specialists deem use of SHF generators as a means of electronic warfare (EW) power more acceptable (i.e., means that do not disable gear but create heavy interference for it by penetrating through defensive filters, along "parasite" receiving channels, through unshielded openings and slits of the gear, and so on).

Infrasonic weapons. The influence of infrasonic oscillations on the human body and mind (e.g., for policy purposes and as weapons) was studied intensively in the United States during the 1960s and 1970s. This work demonstrated that infrasound can affect a person's sensory as well as internal organs and disable him or her in the presence of a certain combination of conditions. Small output levels were shown to cause an unaccountable feeling of fear and create panic in a crowd, and high levels disturbed psychomotor functions and caused appearance of a state that usually precedes an epileptic attack. It is believed that infrasonic weapons will be effective against personnel in shelters and inside combat equipment.

In recent years *electronic warfare* has become a relatively independent, specific form of warfare. Data verified during exercises and during local conflicts show that by using wide-scale, well-coordinated EW measures it is possible to substantially alter the force ratio, disorganize command and control of the enemy's troops and weapons, deprive the enemy of reliable situation information, and force the enemy to act by a previously known method favorable to one's own side. Not long ago, these EW capabilities were proposed to be used mainly to create optimum conditions for delivering damaging attacks against enemy personnel and equipment for purposes of destruction.

At the present, nonlethal weapons can be delivered without losses to targets by using EW systems and equipment. In addition, conditions are created that ensure their most effective employment, sharply reducing or totally excluding friendly losses. In combination with means of information warfare and new generation precision weapons, EW can paralyze the armed forces and state command-and-control points of a less technologically developed enemy.

Means of information warfare. Wide use of computers in weapons and military equipment in all the processes of warfare has also predetermined the appearance of new methods of affecting the enemy, with results (in the assessments of U.S. military specialists) comparable only with mass destruction weapons.

At present it is possible to tentatively describe several types of special effect on enemy computers:

(1) Include appropriate elements in the software of weapon, command and control, and communications systems in advance which disable the computers being served (the elements are activated at the expiration of a certain time interval, by special signal or by another method). This failure may be perceived as a natural equipment malfunction.
(2) Introduce computer viruses by agents, over communications channels, or by other methods to destroy data in data banks and combat system software.

(3) Enter communications channels between computers and introduce false data in them.
(4) Disable computers and erase data by a powerful SHF emission, by electromagnetic pulse, or in another way.

Electromagnetic pulse (EMP) weapons. Theoretical work and experiments conducted abroad show that non-nuclear EMP (super-EMP) generators can be used to effectively disable electronic and electrotechnical equipment, erase data in data banks, and impair computers.

Using nonlethal weapons based on non-nuclear EMP generators, it is possible to disable computers, key enemy radiotechnical and electrotechnical equipment, electronic ignition systems, and other automobile machine units; and detonate or inactivate minefields. Effect of these weapons are rather selective and politically fully acceptable, but their precise delivery to the target vicinity to be engaged is required. Non-nuclear EMP generators can be made compact for use with conventional and precision means of delivery [7].

Russian Views On Third-Generation Nuclear Weapons

Like its Soviet predecessor, the Russian military views third-generation nuclear weapons as a critical component of the MTR. Colonel-General I. Rodionov, head of the General Staff Academy, has mentioned "the possible appearance of third-generation nuclear weapons in the next few years" [8]. V. N. Mikhaylov, Russian minister for Atomic Energy, has argued that third-generation nuclear weapons will be "capable of destroying enemy strategic targets both in space and on earth," and may be usable "in any conflict" [9].

Third-generation weapons will have a small fraction of the global contamination effects of today's warheads, but with the same destructive capability. They will be weapons with directional, selective emission of energy on a target. Such a weapon works like a scalpel. A laser-beam; electromagnetic, X-ray, or microwave radiation; a shock wave [10]. Concentrated in the direction of the target is the force of any of these factors. Development is now under way, and these weapons may well appear within ten years or so. The only barrier to this would be the total prohibition of nuclear tests.

General-Major V. S. Belous has repeatedly warned of dangers in the continuing U.S. development of third-generation nuclear weapons [11]. He notes that special charges (munitions) in which the energy of the explosion is redistributed in favor of a casualty-producing factor through special design served as the origin of third-generation nuclear weapons. For example, the neutron weapon is said to have met the Pentagon's requirement to develop tactical nuclear weapons capable of destroying enemy personnel with "minimum collateral effect."

Belous claims that when the United States resumed nuclear testing after World War II, a new physical phenomenon was discovered (the creation of a powerful pulse of electromagnetic radiation) that proved especially effective in high-altitude bursts. The frequency spectrum of the EMP, corresponding to the radio waveband, is capable of disabling electronic gear, communications and power lines, radios, and radars at long distances.

He charges that in the early 1980s, U.S. military scientists began research aimed at creating one more kind of nuclear weapon, a super-EMP with intensified electromagnetic radiation output. It can be used to increase the intensity of the field at the earth's surface to several hundred kilovolts per meter. Explosion of a 10-mt warhead at an altitude of 300–400 km above the geographic center of the United States (state of Nebraska) is calculated to disrupt the operation of electronic equipment on virtually the country's entire territory for the time necessary to disrupt retaliatory measures.

The casualty effect of the SHF microwave weapon, which has been under development at Sandia National Laboratory, Kirtland Air Force Base, Albuquerque, New Mexico, since 1983, is based on the use of powerful pulses of electromagnetic energy with a wavelength from a millimeter to a meter. The goal is to create a weapon distinguished by aim and narrow directivity of effect. The diameter of its casualty field on the earth's surface should be around 10 km. One design of this weapon consists of three successively arranged explosive electromagnetic generators in which highspeed compression of the magnetic field occurs with the help of the explosion of a small nuclear device. In using this weapon special significance is attached to combatting targets which may change their positions.

According to Russian military experts, the search for reliable destruction of highly "hardened" targets has led U.S. military specialists to the idea of using buried nuclear devices. With detonation of buried nuclear devices there is a considerable increase in energy going to form the crater, areas of physical destruction, and seismic waves. The first model of a penetrating warhead was developed for the Pershing II missile in the early 1980s. The casualty effect of such a warhead depends on the TNT equivalent of the charge and the degree of its burial. Theoretical calculations relying on results of underground nuclear bursts showed that for reliable destruction of "hardened" targets it is necessary to ensure a considerable burial of the nuclear charge in the soil. For example, the destructive effect of a 200-kt nuclear charge detonated at a depth of 15–20 m is equivalent to the surface burst of the 600-kt warhead of an MX missile.

Russian experts also assert that in delivering a penetrating warhead to the target with an accuracy characteristic of the MX and Trident II missiles, U.S. military specialists calculate the probability of destroying an enemy missile silo or command post is near 100%; instead of the two warheads now planned for each target, one will be sufficient. In other words, the probability of destroying targets will be determined only by the technical reliability of delivering warheads to them. Penetrating warheads are designated above all for destroying enemy military and state command-and-control centers, ballistic missiles in silos, command posts, communications centers, and so forth. Consequently, missiles with such warheads will be used in a first strike. The importance of this kind of weapon grows even more in the event of a further reduction in strategic offensive arms, when there will be decreased combat capabilities for delivering a first strike and it will be necessary to increase the kill probability of a target by each weapon. U.S. specialists are examining the possibility of creating penetrating warheads equipped with a system of homing in the terminal flight phase for high accuracy in striking the target.

The United States is also said to have begun work to create a "21st-century anti-missile weapon" (a nuclear-pumped X-ray laser) designed for use as the primary weapon for destroying missiles in the boost phase and during warhead separation. Its combat performance characteristics must ensure disruption of a probable enemy's massive retaliatory strike. Therefore, even before its creation the X-ray laser was called a "salvo-fire" weapon.

As a variant, the Russians say, it is proposed to accommodate nuclear-laser warheads on missiles of nuclear submarines. In a crisis situation or in a period of preparation for delivering a first strike, these submarines must move to patrol areas and take up battle positions as close as possible to the enemy missile basing areas. When a warning of enemy launch comes from the system, missiles are launched from the submarines. As soon as the nuclear-laser warheads arrive at line-of-sight distance, the control system will begin directing the rods to enemy missiles. When each rod occupies a position in which the radiation will hit the target exactly, the computer will give a command and the nuclear device will detonate. Inasmuch as X-ray radiation is absorbed rather effectively in the atmosphere, the nuclear-laser devices can be used at altitudes of more than 80–100 km. There also is another option envisaging the advance insertion of nuclear-laser warheads into near-earth orbits, but both options continue to be in a study stage because of the high vulnerability of orbital objects, the considerable increase in the requisite number of warheads, and the difficulty of both focusing laser radiation and creating a high-speed system for aiming laser rods on their targets. Russian experts have also noted that the X-ray laser is above all a nuclear weapon, and if detonated near the earth's surface it will possess the very same casualty effect as a "conventional" thermonuclear warhead of identical yield.

To eliminate warheads and decoys in the phase of their free flight on a ballistic trajectory, U.S. specialists also propose to use small metal particles accelerated to high velocities by the energy of a nuclear explosion, arbitrarily called nuclear shrapnel. A small, dense particle possessing great kinetic energy because of high velocity is the basis of the new weapon. In striking the target such a particle is capable of damaging or even piercing the casing of a warhead or decoy, which will be demolished on entering dense layers of the atmosphere as a result of intensive aerodynamic heating.

According to the Russians, nuclear shrapnel can be used only in outer space under conditions of airless space, since the particles will burn up at velocities of over 4–5 km/sec. Its use as an antispace weapon for destroying military satellites is not precluded. Therefore, its combat use is possible for blinding the enemy in a first strike.

Programs: Nontraditional Weapons

According to a Russian account published last year, the Soviet Union undertook an intensive R&D effort in the 1970s to develop laser weapons, including space-based models, initially for anti-satellite (ASAT) purposes. By the late 1970s, the Soviet Union had "surpassed the U.S. by a whole stage in terms of full-scale development of space weapons components." An advanced laser system shown to Lawrence Livermore Laboratory scientists during a 1992 visit to the scientific production association Astrofizika in Moscow appears to confirm that the Russians have made highly impressive technological advances in creating powerful, compact laser systems. Specifically, the Russians are world leaders in controlling laser beam quality and propagating laser beams through the atmosphere [12].

In a February 1993 interview, Defense Minister Grachev was asked whether developments are being conducted in the area of laser weapons. "That," he responded, "is in the area of military secrets" [13]. But according to Academician Yu. B. Khariton, chief scientist at the Federal Nuclear Center of the All-Russian Scientific Research Institute for Energetic Physics, a "promising laser device for defending aircraft against anti-aircraft missiles" is being developed at his center [14].

In April 1993, Russian military and scientific spokesmen began to publicize the existence of "plasma weapons," which "can hit any object moving in the earth's atmosphere—be it a missile, a warhead, an aircraft, or some other artificial or natural heavenly body such as a meteorite." This is accomplished using an existing technological base (without putting any components into space) and harnessing the kinetic energy of the object itself, which is intercepted electronically by a plasmoid created by facilities on the ground (microwave or optical (laser) generators, and antennae and other systems) [15].

The energy directed by the earth-based components of the plasma weapon is focused not on the target itself but on its flight path in the area of the atmosphere directly ahead of it. It ionizes that area of the atmosphere and totally upsets the aerodynamics of the missile or aircraft. The object leaves its trajectory and is destroyed by enormous stresses. It is virtually impossible to counter this effect of terrestrial energy. In addition, it is possible for the first time to combine in a single unit radar observation systems and systems for the electronic delivery of the plasmoid (the kill mechanism) to the target at the speed of light. This makes the plasmoid a "virtually invulnerable weapon providing guaranteed protection against any attack from space or the upper or lower strata of the atmosphere" [16].

Ballistic targets include not only the warheads proper but also decoy targets. Their differentiation is said to be a complicated task that has gone unresolved until now. But radiation means of destruction (laser and SHF weapon) seemingly resolve this task in principle since the number of equivalent responses is unlimited. In other words, all targets (both genuine and false) could be destroyed consecutively, and with non-nuclear means of interception.

The radar observation systems can lock onto a target or group of targets at a distance of 100 km, and the plasmoid destroys them at an altitude of up to 50 km according to the task in question. Furthermore, one does not need to build great power stations for this because the energy output of a few dozen domestic storage batteries for each of the powerful generators belonging to the complex is quite sufficient to make such protection feasible.

According to experts such as Admiral V. S. Pirumov, the plasma weapon was created in Russia. Research on it has gone beyond the laboratory walls and is being tested in real life. But a full-scale experiment against real targets (intercontinental ballistic missiles [ICBMs] and supersonic planes) requires great financial outlay. Russia is therefore proposing that the United States and Russia pool their efforts and jointly create a global antimissile protection system. Such an experiment could be conducted on the U.S. island of Kwajalein in the Pacific, where the appropriate material and technical base exists and where the U.S. military has already conducted a number of tests for the Strategic Defense Initiative (SDI) program.

Russia would supply the necessary equipment on board aircraft carriers and other ships. It is well known that Russia has considerable achievements and advantages in the sphere of creating powerful microwave generators (potential components of the plasma weapon) and in the sphere of the new science of plasma-gas dynamics. The United States would supply the solid-state electronics and computer technology. Missiles for the experiment could be launched either from the territory of Russia or from U.S. test ranges [17].

Programs: Third-Generation Nuclear Weapons

Russian military and scientific experts have also focused on the combat capabilities of low- and high-yield *miniaturized* nuclear devices. Minister for Atomic Energy, Mikhaylov has noted that, "You can drop a couple of hundred little bombs on foreign territory, the enemy is devastated, but for the aggressor there are no consequences" [18]. When based in space, such weapons are said to be capable of generating a "directed shock wave" accurate enough to strike even hardened underground targets such as military and state command-and-control centers, nuclear facilities, and so forth. In late 1992, General-Lieutenant and academician Ye. A. Negin announced that Russia has already developed a mini-nuke whose yield has more than doubled and whose weight is one-hundredth of what it was. In the words of academician Khariton, it has "many subtleties and much elegance" [19].

In March 1993 the Russian Defense Ministry announced that, "No experiments on targeted nuclear explosions with the aim of creating tectonic weapons were conducted and are being conducted in the system of the Russian Defense Ministry" [20]. The statement was made following mass media reports alleging that research was going on in the interests of the Russian Defense Ministry to create the so-called tectonic weapons and that experiments were made to imitate earthquakes in different regions of the world with the help of nuclear explosions [21]. The environmental perturbations generated by these weapons are designed to destroy "hardened" underground targets such as command-and-control centers and nuclear facilities.

Russia's New Military Doctrine

On November 2, 1993, President Boris Yeltsin and his Security Council approved Russia's first official military doctrine. Like the May 1992 draft doctrine, the official document stresses Russia's need to acquire those cutting-edge military technologies most promising for the conduct of both local and large-scale wars.

The new Russian military doctrine calls for

- priority allocation of appropriations for the most promising scientific and technological defense developments to ensure Russia's security and develop its economy;
- fundamental and applied research and experimental-design developments that will ensure Russia's ability to react effectively to emerging military threats and military-technical breakthroughs;
- development and production of highly efficient command, control, communications, and intelligence (C3I), strategic warning, EW, and precision non-nuclear weapons systems, as well as systems for their information support;

- application of the latest scientific and technical achievements for developing new generations of weapons, and the maximum use of mathematical models for assessing their combat efficiency before starting serial production [22].

The role of emerging military technologies is also reflected in the new doctrine's repudiation of the nuclear no-first-use pledge. In 1982, General Secretary Leonid Brezhnev announced the Soviet pledge to never use nuclear weapons first. This pledge reflected above all the Soviet Union's confidence that it had achieved conventional superiority over the West. In late 1991, however, the military began to question the utility of such a pledge, and Russia's new military doctrine has now officially repudiated it. The new stance stems logically from their loss of quantitative superiority in conventional arms, from the proliferation of nuclear weapons, and especially from their ongoing lag in new technologies, as epitomized by Desert Storm.

At first glance, the dropping of the pledge could simply reflect the Russian military's recognition that its current situation is identical to that of the United States and NATO in the mid-1970s. Deprived of conventional superiority, it will be compelled to cross the nuclear threshold first. But Russian military planners have articulated at least three concrete scenarios for the preemptive use of nuclear weapons. For example, the May 1992 draft military doctrine announced that a conventional strike on Russia's nuclear or other ecologically dangerous targets would elicit a nuclear response by Russia.

By early 1993, the Russian General Staff therefore argued the need to resurrect old scenarios for waging limited nuclear war. Owing to the Russian lag in new technologies, multiple, independently targeted reentry vehicles (MIRVed) ballistic missiles are now said to be the sole means of ensuring retaliation against strikes by advanced non-nuclear systems. As a result, some senior military officials state that Russia will become the "main brake" to any further reductions in strategic nuclear arms.

Implications For Russian Military Policy

Depending on the complexion of Russia's political leadership, the acquisition of emerging military technologies could serve a variety of policy objectives. According to the current General Staff, development of the new technologies will help to ensure (1) rehabilitation of the Russian economy, (2) ability to conduct local and large-scale wars without resorting to nuclear weapons, (3) maintenance of strategic stability, and (4) resurrection of Russia's superpower status.

According to *Red Star* in February 1993, Defense Minister Grachev has created a separate "Council for Military-Technical Policy" of the Russian Ministry of Defense [23]. Headed by Deputy Defense Minister Andrei Kokoshin, the council will develop a new military-technical policy for equipping the Russian Armed Forces with weapons and materiel. Kokoshin has explained that the military-technical policy of the Defense Ministry proceeds from military doctrine, operational-strategic plans developed by the General Staff, and Russia's general economic policy [24].

Kokoshin has stressed the need to get ahead of the game in the field of next generation scientific and technical developments and to preserve Russia's scientific and technical potential to the maximum extent [25]. The defense complex, he argues, is perhaps Russia's "main resource" for maintaining a high ranking in the world economy

[26]. Thus it would be wrong to view the defense industry merely as a source of armaments and military hardware. Such scientific and technical might is concentrated there that it could become an important component of the market economy, and a source for ensuring the competitiveness of Russian goods in the world market.

Russia's defense industry, he continues, is the main national resource for competitiveness in the area of industrial products (particularly scientific-intensive products) and services. This applies to many types of space equipment (primarily to missile construction), to the aviation industry, to several areas of shipbuilding, to production of high-quality steels and composite materials, to diverse types of laser equipment, to production of computer software, to quantum electronics, and so forth. It is therefore impossible to speak of the transformation of Russia's defense complex outside the context of a "national industrial policy": a long-term policy aimed at the gradual conquest by Russia and its defense industry of "commanding heights" in the world economy and in the world industrial and economic hierarchy. Russia is said to have all the necessary initial conditions for this [27].

It is important for Russia to retain efficient operators at its defense enterprises, which should form the "locomotives" of Russia's national industrial policy. Kokoshin recommends starting with about 30 "companies" which would emerge on the basis of the military-industrial complex and evolve into hi-tech producers for both military and civilian needs [28]. "Locomotive" enterprises (particularly from the aviation and space sectors) will have a catalyzing effect on the recuperation of Russia's economy. Small and medium enterprises will be concentrated around them since, vulnerable from both economic and criminogenic points of view, they may survive and prosper under the umbrella of the giant enterprises.

Emerging technologies of the MTR have also prompted the Russian military to redefine the prerequisites for maintaining strategic stability and deterrence. While nuclear parity remains the linchpin of strategic stability, the new non-nuclear systems are said to be threatening the old strategic equation. Deterrence now requires not only nuclear parity, but also parity in cutting-edge non-nuclear technologies. The crushing weight of these systems is negating the more traditional measures of military power and revolutionizing national security objectives.

Despite ongoing political gridlock and economic chaos in Russia, the Russian General Staff continues to plan for future war (much as the Soviet General Staff did in the 1920s). For the short term, they have devised sophisticated technical and operational counters to the new technologies demonstrated in Desert Storm. For the long term, they have focused most of their limited resources on creating an infrastructure that ensures rapid surge production of new military technologies as the situation warrants. For the transitional period between the two, they have resurrected the concept of limited nuclear war to cope with a variety of worst-case scenarios.

It is noteworthy that a strong civil-military consensus currently exists in Russia regarding the nature and requirements of future war. This consensus reflects a continuing and disproportionate emphasis on military power as the linchpin of Russia's status in the international arena. Both its civilian and military leaders agree that military-technical potential for parity and even superiority in the MTR represents Russia's main guarantee for preserving its hard-won superpower status. Whether or not this competition occurs, the West can only benefit from their long-term vision. As the heart of this vision, the concept of technological deterrence cannot be ignored.

Notes

1. For example, see Captain 1st Rank L. P. Malyshev, "Factors Influencing State Military Policy," *Voennaya mysl'* 1 (1992): 64–66.
2. Moscow conversations with General-Major V. Slipchenko, May 1993.
3. Interview with Defense Minister P. Grachev, "General Grachev on the Army and on the Soldier," *Argumenty i fakty* 5 (Feb. 1993): 1–2. Emphasis added.
4. For example, see General-Lieutenant A. I. Paliy, "A Methodology for Classifying the Means and Forces of Warfare," *VM* 2 (1993): 53–60.
5. L. Mlechin and V. Shildyayev, "Generals Dream of a Hyperboloid. . . .," *Novoe vremya* 26 (1992): 41–43.
6. For example, see Colonel V. V. Krysanov, "On the Features of Development of the Forms of Military Action,"*VM* 2 (1992): 42–45.
7. For example, see Colonel S. Vybornov, "U.S. Non-Lethal Weapons," *Zarubezhnoe voennoe obozrenie* 4 (1993): 10–14.
8. Colonel-General I. Rodionov, "On Several Problems in the Development of Military Science," *VM* 11–12 (1991): 47.
9 V. N. Mikhaylov, "The Keys from the Nuclear Arsenal," *Pravitel' stvennyi vestnik* 12 (1991): 12.
10. Ibid.
11. For example, see General-Major V. S. Belous, "Third-Generation Nuclear Weapons," *VM* 11–12 (1991): 117–121.
12. *Aviation Week and Space Technology*, July 20, 1992, pp. 64–65.
13. Grachev, "On Army."
14. Interview with Yu. Khariton, *Krasnaya zvezda*, Aug. 11, 1992.
15. "Joint Testing of 'Plasma Weapon' Proposed with U.S.," in FBIS-SOV-93-065, Apr. 7, 1993.
16. "Will Plasma Weapons Be Tested?" *Novoe Vremya*, February 4, 1993, p. 1.
17. Moscow conversations with Admiral V. S. Pirumov, May 1993.
18. V. Mikhaylov, *Komsomol'skaya pravda*, July 19, 1990.
19. Cited in M. Rebrov, "Three Generations of Bombs. . . .," *KZ*, Oct. 27, 1992.
20. Mikhaylov, *Komsomol'skaya pravda*.
21. "Defense Ministry Denies Development of Tectonic Weapons," in FBIS-SOV-93-046, March 11, 1993.
22. "Basic Provisions of the Military Doctrine of the Russian Federation," *Voennaya mysl'* (Nov. 1993 Special Edition): 3–23.
23. *KZ*, Feb. 18, 1993.
24. "Military-Technical Policy Council Holds First Meeting," in FBIS-SOV-93-104, June 2, 1993.
25. O. Vladykin, "New Army with Old Weapons: Is This the Kind of Prospect Russia Needs?" *KZ*, August 19, 1992.
26. "Deputy Defense Minister on Long-Term Security," in FBIS-SOV-92-105, June 1, 1992.
27. Ibid.
28. "Deputy Minister Assesses Defense, Nuclear Policies" in FBIS-SOV-92-233, December 3, 1992, pp. 13-15.