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21st Century—Era of Nuclear Pygmies?

914K0018A Moscow SSHA: EKONOMIKA, POLITIKA, IDEOLOGIYA in Russian No 2, Feb 91 (signed to press 20 Feb 91) pp 3-13

[Article by Valeriy Fedorovich Davydov, candidate of historical sciences and senior scientific associate at Institute of U.S. and Canadian Studies]

[Text] Now that the "cold war" is over and mankind has a real chance of escaping the nuclear armageddon, dark clouds are beginning to gather again over the recently illuminated horizon of international security. The accumulation of weapons of mass destruction (nuclear, chemical, and missiles) is picking up speed in the "Third World" countries. This is one of the central topics of discussion at meetings of the leaders of the two superpowers, which might fall out of the frying pan of bilateral confrontation into the fire of multilateral nuclear wars in the "Third World" at any time. This sinister prospect is the reason for the search for optimal ways of averting the spread of weapons of mass destruction, beginning with the immediate measures to be taken by the founders of the nuclear nonproliferation framework—the Soviet Union and the United States.

The "Nuclear Club" and the Near-Nuclear Countries

At the height of the "cold war" in the 1960s, these two powers acknowledged the need to limit the number of members in the "nuclear club" in the interest of international security and their own safety. The nonproliferation framework was established largely as a result of their combined efforts: 140 countries will be party to it in 1991. The USSR and the United States still attach great importance to the coordination of policy in this sphere of international relations. Soviet-American interaction in the fight against nuclear terrorism began in 1989. There is no question that the political convergence of the two states could secure even broader opportunities for joint or parallel action to reinforce the nonproliferation framework.

It is also becoming obvious, however, that their bilateral efforts are not commensurate with the threat nuclear proliferation poses to international security. Around 30 states are still outside the confines of the nonproliferation treaty, including two nuclear states—the PRC and France—and a group of "threshold countries"—Israel, India, Pakistan, South Africa, Argentina, Brazil, and others. The "nuclear club" is actually displaying slow but consistent growth. Now it is even difficult to say exactly how many nuclear powers there are.

According to experts from the Carnegie Endowment, Israel might already have nuclear potential, numbering around 200 weapons, and South Africa might have 20; by 1991 India will be capable of producing 100 nuclear devices comparable in force to the bomb dropped on Hiroshima, and Pakistan will be capable of producing 15 such devices; Argentina and Brazil are capable of producing nuclear weapons quickly if the corresponding decisions should be made.[1]

The political ambitions of several countries party to the nonproliferation treaty also indicate their desire to acquire nuclear weapons. This group includes Iraq, Syria, Libya, Iran, Taiwan, North and South Korea, Turkey, Greece, Nigeria, and others. It is true that the commitments they assumed in connection with the treaty, pledging not to develop these weapons, are slowing down their journey along the "nuclear road" somewhat. Furthermore, most of them still do not have sufficient technological potential, but this is only a matter of time. According to Soviet data, there are 13 "threshold" states in the world today.[2] Western experts estimate that there will be 30-40 by the beginning of the 21st century, and half of these will be "Third World" countries.[3]

Most of these states are concentrating on the accumulation of what is known as the "poor man's atom bomb"—chemical weapons—as a way-station on the road to the superweapon. According to the Pentagon's research service, 20 "Third World" countries have or plan to have arsenals of this type.[4] Chemical weapons are known to have been used already in the Iran-Iraq war.

In our day the problem of nuclear proliferation has acquired a new dimension—the "missile" dimension. The strongest candidates for the "nuclear club" are not wasting time but are developing and acquiring the delivery vehicles for nuclear and chemical weapons. Israel has been testing the Jericho-2 ballistic missile with a range of over 1,500 kilometers since 1987. Tel Aviv has launched two satellites, and this indicates its ability to produce modern carriers comparable to those used by the nuclear states. According to experts, Israel is working with South Africa on the development of cruise missiles. In 1989 South Africa tested intermediate-range missiles close to its coastline. The Arab states are stepping up their own programs. In 1990 Iraq tested a three-stage rocket capable of putting a satellite in orbit. In 1988 Saudi Arabia bought "East Wind" missiles with a range of over 2,500 kilometers from the PRC. Syria, Egypt, Libya, Iran, and Turkey are fully determined to succeed in this area. Libyan leader M. Qadhdhafi expressed the prevailing attitude in several Middle Eastern states when he said in June 1990 that "we must work day and night and redouble our efforts to conquer space and establish an atomic industry."[5]

India has conducted several tests of an intermediate-range ballistic missile and satellite launches. Pakistan is trying to keep up with India, and it used a Chinese rocket to launch a satellite in 1990. Argentina and Brazil have sweeping space programs. "Third World" countries are cooperating more extensively in this sphere. Whereas the development of the delivery vehicles of nuclear weapons was once considered to be a lengthy and expensive process, the matter has now been simplified considerably, and largely because of the imprudent shipments of

missiles and technology to the "Third World" countries by the United States, the Soviet Union, and the European states during the years of the "cold war." According to experts, more than 20 developing countries could be members of the "missile club" by the beginning of the 21st century.[6]

There is every indication that the 21st century might be one in which the tone is set not by the superpowers, but by many small states with nuclear missiles. This prediction sounds plausible because there is no longer any certainty that the nuclear nonproliferation treaty, the main political obstacle to the acquisition of these weapons, can be upheld in the next century.

In 1995 the states party to the treaty will officially decide the length of the renewal term. In fact, it is already clear that the main issue will be something else. The topic of discussion will be the very content of the document and the fulfillment of commitments by nuclear and non-nuclear signatories. All of the international conferences to verify its efficacy (in 1975, 1980, 1985, and 1990) clearly indicated that most of the non-nuclear countries feel that the United States and USSR have violated the provisions of Article VI on nuclear disarmament.

It is true that the references to this article of the nonproliferation treaty in the Soviet-American SALT I and SALT II agreements could not be called anything other than an attempt to deceive the non-nuclear countries, because SALT I and SALT II envisaged limits on the growth of nuclear potential instead of its actual reduction. After signing the nonproliferation treaty in 1968, the United States and USSR compounded their nuclear arsenals, which eventually numbered 50,000 weapons.

A similar reference in the Soviet-American INF Treaty sounds equally unconvincing. The text of the agreement stipulated that the two countries could use the nuclear contents of eliminated missiles at their own discretion, and this certainly does not exclude the possibility of their use to develop new types of nuclear weapons. This immediately evoked a storm of criticism at the third special session of the UN General Assembly on disarmament in 1988. It is hardly surprising that the projected 50-percent reduction of U.S. and USSR strategic arsenals might be compromised seriously if this document does not record a clear-cut ban on the military reuse of the fissionable materials from the destroyed warheads. Even if it does prohibit this, however, another question will have to be answered: What difference will it make to the non-nuclear countries that the world could have been destroyed ten times over by the nuclear forces of the two powers before this historic agreement and only five times after?

We must realize that unless all nuclear tests and the production of fissionable materials for military purposes are stopped, all Soviet-American agreements on the reduction of nuclear arsenals, even the most radical ones, might be viewed as attempts by the nuclear powers to continue the qualitative arms race and hold onto their dominant position in the military sphere. Most of the states in the world will not accept this state of affairs.

At the 1995 conference these states will ask whether the United States and USSR are ready and willing to give up all of their nuclear weapons. This willingness has not been apparent to date. Under these circumstances, the crisis of the nonproliferation treaty seems inevitable. Countries striving to develop their own nuclear weapons will have a plausible excuse to openly declare themselves nuclear states.

The policy of the United States and USSR on nonproliferation has been based on discrimination since the 1960s: We (nuclear powers) can have nuclear weapons, and you (non-nuclear states) cannot. The fruits of this discriminatory principle could have unpredictable negative effects on international security in the future.

If Washington and Moscow have tens of thousands of nuclear warheads at their disposal, will a dozen or a hundred nuclear devices in the arsenals of 10-20 developing countries pose a great threat to American and Soviet interests? Obviously, the United States and the USSR regard even one or two strikes on their territory as an unacceptable threat to their security.

This threat will be compounded by the spread of nuclear missiles.

What will the world of the 21st century look like in this case? Strategic stability will be replaced by strategic chaos, in which the danger of regional nuclear conflicts, the involvement of the great nuclear powers in them, and the anonymity of missile strikes will be compounded. The center of nuclear danger is already shifting from the zone of the developed countries (along the East-West line) to the developing zone. Threats to use nuclear and chemical weapons could be heard in the Middle East throughout 1990 in the conflict between Israel and Iraq and the United States and Iraq. That same year there was the danger of nuclear war between India and Pakistan over Kashmir.

Few experts believe that the nuclear states will use nuclear weapons against each other. The military significance of various types of nuclear arms is undergoing unprecedented devaluation, and there has been a loss of interest in bilateral Soviet-American arms control agreements. The era of nuclear rivalry between the superpowers has come to an end, but the era of the spread of weapons of mass destruction is just beginning. The age of so-called nuclear pygmies might not come to pass, but this will necessitate unprecedented, coordinated, and concerted preventive action by the United States and USSR.

New Approaches

To make their policy in the sphere of nuclear nonproliferation more effective, they will probably have to base it on new principles: First of all, they will have to realize that nuclear proliferation is equally or more threatening

to the security interests of both countries than their own opposing nuclear forces, and not only over the long or medium range. It is precisely from this standpoint that they should rebuild their political and military relations, and the sooner the better.

Second, it is completely obvious that the irreconcilable cannot be reconciled: It will be impossible to retain the "nuclear club" and not allow any new members to join. They can only prevent the growth of the "nuclear club" by disbanding it, taking far-reaching steps in this direction—a total ban on nuclear tests, the production of fissionable materials for military purposes, or the use of nuclear weapons. Only this can keep the Treaty on the Non-Proliferation of Nuclear Weapons and the corresponding framework alive in the 21st century.

Third, they must acknowledge that the "threshold" countries and new members of the "missile club" were able to succeed largely by taking advantage of the Soviet-American competition and using it for their own purposes. If anyone won the Afghan war, it was Pakistan, which managed to gain the repeal of the Symington amendment from the United States and is now receiving military assistance. The bombing of nuclear installations in Pakistan was the subject of serious debates in Washington in the 1970s, but in the 1990s they will be protected by air defense systems supplied by the United States. This points up the need for radical changes in the approach of the nuclear powers to the "threshold" countries in the world's crisis zones.

Fourth, the United States and USSR must realize that they can hardly deter the further spread of nuclear weapons if they continue to view the "threshold" countries only as objects of their own policy. The resolution of this problem will demand close cooperation with these countries, with consideration for their legitimate security interests.

Fifth, they must rely primarily on political methods of solving the problems of nuclear proliferation, avoiding adventurism and the use of these problems as an excuse to justify preparations for a "cold war"—between the North and South this time.

Will the United States and USSR be able to restructure their military and political relations quickly in such a way as to subordinate them completely to the need to combat the new threat? The success of the policies and actions of these two countries in this sphere will depend largely on the answer to this question.

As the architects of the nonproliferation framework, they must breathe new life into the treaty, secure its continued efficacy in the 21st century, and try to find a way of including all of the "threshold" countries that are still not party to the treaty in this framework. They must also make the clear stipulation that they will condemn the acquisition of nuclear weapons by any state, regardless of the nature of their relations with it, and will interpret any use of weapons of mass destruction as a crime against humanity.

The drafting of a special declaration on nuclear nonproliferation by the UN Security Council seems important in this context. The USSR and the United States should also take a constructive approach to the proposals regarding the reform of the nonproliferation treaty that envisage direct participation by the main candidates for membership in the "nuclear club" (for example, India's 1988 proposal that the members pledge to eliminate all of their nuclear weapons by 2010 and the "threshold" states pledge not to cross the nuclear threshold). Both powers should provide unequivocal assurances that they will not hold onto their nuclear status and will support the complete elimination of all nuclear arms in the world as quickly as possible and in compliance with a strict schedule.

The existing worldwide nonproliferation framework should include additional barriers to preparations by "threshold" countries. This could be accomplished by a total ban on nuclear tests and the production of fissionable materials for military purposes.

Sooner or later the nuclear programs of "threshold" countries will require the testing of the devices. The existence of a treaty on their complete prohibition would serve essentially as an insurmountable obstacle to political decisions to conduct these tests in any "threshold" country. In this way, the work on programs to develop reliable nuclear forces could be stopped in an early stage. In spite of the practicality of this move, the nuclear powers are still incapable of making it or of taking advantage of the current willingness of most of the "near-nuclear" countries to become party to an international total nuclear test ban treaty.

The situation with regard to the problem of fissionable materials for military purposes is comparable. As long as they are produced in the nuclear countries, the strongest candidates for the "nuclear club" cannot be expected to abandon this pursuit. The many years of attempts to persuade Pakistan, Argentina, Brazil, India, Israel, and South Africa to put their capacities for the production of enriched uranium and weapon-grade plutonium under IAEA control were unproductive. It is obvious that only the agreement of the nuclear powers to stop this production will encourage "threshold" countries to take the same step. The idea of expanding IAEA functions in the sphere of nuclear disarmament seems quite appealing. The fissionable materials from the destroyed warheads of American and Soviet missiles could be sent to this international organization for use in peaceful atomic programs. This would serve as eloquent proof of the willingness of both powers to beat their swords into ploughshares and convert their nuclear production in line with President D. Eisenhower's "Atoms for Peace" program.[7]

The paradox of the global policy of deterring the nuclear ambitions of the "threshold" countries is the following: They have to be treated as de facto nuclear states before their efforts to acquire nuclear status can be stopped.

Most of the measures to deter nuclear proliferation in the Middle East, South Asia, Latin America, and Africa might seem acceptable to the "near-nuclear" countries if they are of a global rather than regional nature:

The refusal of these countries to conduct tests of nuclear weapons will only be credible in the presence of an international total test ban treaty;

The cessation of the production of fissionable materials for military purposes will be accomplished only after the establishment of a moratorium on their production in the United States, the USSR, and other nuclear powers;

International inspections of all nuclear installations in these countries will only be possible if the installations in the nuclear countries are fully accessible.

The absurdity of the current state of affairs in this sphere is obvious. "Mutual deterrence" between the United States and the USSR could work for a long time even without any nuclear tests and without the continued accumulation of fissionable materials, but no decisive moves have been made with regard to these major aspects of nuclear nonproliferation. Certain questions—such as, for example, how many nuclear tests have the United States and USSR conducted? How much fissionable material have they accumulated? Who is ahead and who is behind?—sound pointless to any sensible person. The military-industrial complexes in the nuclear states oppose these bans and essentially become the allies of forces advocating the creation of a similar atomic military industry in the "threshold" countries. The cost of delays in solving the problem could be quite high for international security. Military and political leaders must realize that the problems of bilateral Soviet-American nuclear competition will seem like child's play in comparison with the problems in multilateral nuclear relations in the event of the further spread of nuclear missiles in an atmosphere in which strategic stability will turn into strategic chaos.

However important the current bilateral U.S.-USSR arms control agreements might be to the security interests of the two countries and their allies, they have virtually no power to strengthen the nonproliferation treaty or to slow down the nuclear preparations of "threshold" countries. Under these conditions, it seems important for both powers to attach primary significance to multilateral arms control agreements. We have to agree with J. Nye, the former special assistant to the U.S. secretary of state: "If the spread of force in the world continues, the most important job of the superpowers...will be to design multilateral structures...in the sphere of disarmament."[8]

Missile Control

A situation in which the territory of the USSR, the United States, and the European countries are the targets of nuclear missiles deployed in "Third World" countries—in the Middle East, for example—would be a strategic nightmare. From the technical standpoint, it is only a matter of time. The need for immediate measures to prevent the spread of nuclear missiles is evident from our recollections of how the launching of the first satellite by the USSR in the 1950s gave rise to a frenzy of militarism and aroused panic in U.S. military-political circles.

The missile technology control regime, which was established in 1987 by seven industrially developed Western countries—the United States, England, France, the FRG, Italy, Japan, and Canada—and in which the USSR agreed to participate in 1990, is important but belated. The regime specifically envisages the prohibition of exports of missiles with a range of over 300 kilometers and a payload of over 500 kilograms, which is viewed as discrimination by most of the developing countries. Many of them already have their own industrial base for missile production and are developing bilateral forms of cooperation. Of course, international measures would be more effective if the new suppliers of missile technology, including developing countries, were to be party to them as well, but a pledge not to supply missile technology does not preclude the modification of missiles in the producing countries.

All of this suggests the need for more resolute action and the transfer of bilateral Soviet-American arms control agreements to a multilateral basis. Would it be possible, for example, to achieve a global ban on intermediate- and shorter-range missiles by allowing other nuclear and "near-nuclear" countries to become party to the Soviet-American INF Treaty? Obviously, attempts could also be made to conclude an international treaty on a total ban on tactical nuclear missiles and nuclear artillery, particularly now that the expediency of this kind of agreement for Europe already seems indisputable. Implementing the ideas of a global ban on all intermediate-, shorter-, and short-range land-based nuclear ballistic missiles and nuclear artillery, excluding only intercontinental missiles, could have a significant impact.

By the same token, in view of the fact that battlefield weapons will be the first nuclear weapons to make their appearance in the arsenals of developing countries, an international agreement on a total ban on all types of tactical nuclear weapons is already of primary importance today. The agreement could be initiated by the nuclear states and their non-nuclear bloc allies.

A great deal will depend on how quickly and how far the two powers progress in the radical dismantling of the structures of bilateral nuclear confrontation, in which many types of nuclear weapons which are not needed purely for deterrence have been integrated. The devaluation of the military significance of some types of nuclear weapons in U.S. and USSR arsenals will not only allow them to agree to the elimination of whole classes, as in the case of the INF, but would also promote international security by encouraging them to advocate their global prohibition.

The idea of creating zones free of nuclear and chemical weapons and missiles in the Middle East, South Asia, Korea, Africa, and Latin America warrants serious consideration.

Middle East: From the standpoint of the probable use of nuclear and chemical weapons and missiles, this region arouses the most concern. We could hardly expect the opposing sides in the Arab-Israeli conflict to achieve the kind of mutual deterrence that existed in East-West relations. The Arab countries are trying to counterbalance Israel's growing nuclear missile potential with chemical missiles and still hope to develop their own nuclear weapons in the future. It is no coincidence that many of them are engaged in illegal activity in the gray and black markets for nuclear materials. The United States and USSR encountered the previously incredible prospect of becoming involved in a chemical and nuclear missile conflict against their will as a result of the actions of allies and friendly countries, and realized the need to seek effective ways of demilitarizing this region.

The creation of a nuclear-free zone could play an important role in slowing down the spread of nuclear weapons. All of the states in the Middle East, including Israel, support this idea. The UN General Assembly regularly passes resolutions in support of this. The Soviet Union has stressed the need to implement them without delay. In principle, the United States does not have any objections to the creation of a nuclear-free zone here either, but in the absence of a general Middle East settlement, no concrete action can be taken to implement the idea of the nuclear-free zone.

Most of the Arab states view the nuclear-free zone as a means of stopping Israel's nuclear preparations and putting its nuclear installations under international control. At this time it is difficult to say whether Israel will agree to these demands, but ruling circles in Israel are beginning to realize that the Arabs are unlikely to allow Tel Aviv to keep its monopoly in the nuclear sphere forever. Iraq's aggressive behavior in the conflict it started in the Persian Gulf zone added a new nuance to the problem of the use of nuclear weapons. No one knows exactly how close Iraq is to the development of nuclear weapons.

Israel is also disturbed by the fact that several Arab countries are accumulating chemical weapons as a counterbalance to its own nuclear potential. All of this explains Israel's more positive attitude toward the idea of creating a zone free of nuclear and chemical weapons and toward various proposals that could turn the entire Middle East into a zone free of weapons of mass destruction.

The rapid spread of ballistic missiles is turning this region into a source of nuclear and chemical danger for the European countries, the USSR, and the United States. Stopping these dangerous tendencies will necessitate coordinated political action—for example, the attachment of all the Middle East states to the INF Treaty.

One productive idea which could be a step toward the zone free of weapons of mass destruction is the suggestion that all of the Middle East states, as well as the United States, the USSR, England, and France, pledge not to use any of these types of weapons in the region. The permanent members of the UN Security Council have apparently realized that they have to offer collective security guarantees to all of the countries in the Middle East without exception.

South Asia: India does not accept Pakistan's proposal of a nuclear-free zone and bases its objections on the fact that the nuclear weapons of other states (the PRC and the United States in the Indian Ocean) are located close to its borders. Furthermore, Delhi regards the nuclear powers' guarantees not to use nuclear weapons against non-nuclear countries as an insult to its national dignity. It is possible, however, that India would agree to become party to the nuclear-free zone if the denuclearization of the Indian Ocean, the border regions of the PRC, and the Central Asian republics of the USSR should be accomplished. The idea of declaring the entire Asian continent, including the Near and Far East and the Caucasian and Central Asian republics of the USSR, a zone free of nuclear weapons, with certain exceptions for the PRC and USSR, also seems promising.

The issue of nuclear nonproliferation in South Asia warrants consideration at a special summit-level conference of the leaders of the USSR, United States, PRC, India, and Pakistan. The withdrawal of Soviet troops from Afghanistan gave the United States broader opportunities to influence Islamabad's behavior in nuclear matters and threaten to stop arms shipments in the event of the intensification of its nuclear preparations.[9] It would probably be best for the Soviet Union not to foster Delhi's military ambitions by leasing it Soviet atomic submarines. In addition, the United States and USSR should make their arms deliveries conditional upon a pledge by Pakistan and India not to use the arms as delivery vehicles for nuclear weapons. They should not nurture the illusion that the Indian-Pakistani agreements on mutual inspections of several installations and the mutual pledge not to attack these installations might slow down their nuclear preparations. These agreements look like an attempt to join the "nuclear club" hand in hand while minimizing the possibility of anonymous attacks on their own nuclear installations.

Korean peninsula: The DPRK's procrastination on the question of putting its nuclear installations, imported from the USSR, under IAEA control is arousing serious doubts about Pyongyang's intentions. There are distinct similarities with Romania's position under the Ceausescu regime. Not long before his fall, Ceausescu proudly announced that Romania was capable of building an atomic bomb and carrying out a missile engineering

program. Obviously, this aroused doubts about his compliance with nonproliferation treaty commitments. Cuba, which is still not party to the nonproliferation treaty, is another of the countries in the same category as the DPRK. The collapse of the socialist system could encourage several totalitarian regimes to acquire nuclear weapons as a decisive guarantee of their continued existence in the world arena.

Nevertheless, the DPRK's concerns about the American nuclear weapons that are still deployed in South Korea cannot be dismissed. This certainly could motivate Pyongyang to acquire its own atomic bomb. The DPRK regularly proposes the declaration of the Korean peninsula a nuclear-free zone. The realization of this plan could create serious obstacles to block the nuclear ambitions of North and South Korea.

Africa: The creation of a nuclear-free zone in Africa has the best chance of success, because all of the states on the African continent support the idea. The USSR is in favor of the idea, and the United States has not voiced any official objections. A nuclear-free zone could be a significant obstacle to Pretoria's nuclear ambitions. South Africa's acquisition of missiles, the intentions of several Arab states to use the countries of the continent as a testing ground for missile systems, and the involvement of several African countries in the missile race point up the need to turn the African continent into a zone free of nuclear missiles.

Latin America: States with a developed atomic industry and missile engineering program—Argentina and Brazil—are still not party to the Tlatelolco treaty on the prohibition of nuclear weapons in Latin America. These countries are not party to the nonproliferation treaty and are supplying nuclear and missile technology to the Middle East. Interaction by the United States, the USSR, and the European countries should focus on closing off new channels for the spread of missile and nuclear technology. It would probably be best to institute coordinated efforts to include Argentina and Brazil in existing international control frameworks. It also seems necessary to define and clarify the political conditions under which Argentina, Brazil, and Cuba might become party to the Tlatelolco treaty and the nonproliferation treaty. Just as in other parts of the world, in Latin America the prevention of the spread of nuclear missiles should be a primary objective of U.S. and USSR policy.

To Avoid Missing the "Train"

Of course, not all multilateral arms control negotiations can be fruitful, but even the very consideration of these matters by the United States and the Soviet Union and their discussion on a high international level could have a deterring political impact on the proliferation of weapons of mass destruction, including nuclear weapons, in the world.

The disturbing thing about multilateral arms control agreements is that the idea is brought up when the "train" has already pulled out of the station or is just about to leave. Another reason for pessimism is the amount of time it takes the nuclear powers to reach an understanding with each other, not to mention the amount of time it takes them to settle matters connected with third countries. It took more than 15 years, for example, for the United States and USSR to ratify two "threshold" treaties on the limitation of nuclear tests—the 1974 and 1976 treaties. Furthermore, these agreements do nothing to prevent nuclear proliferation and might even be harmful because they legitimize nuclear tests. Another example is the projected international convention on the prohibition of chemical weapons. Several obstacles to its acceptance by many countries were already apparent during the discussion stage.

As the two strongest nuclear powers, the United States and USSR must assume most of the responsibility for the elimination of the nuclear threat, and they must be farsighted in their assessments of new sources of danger and realize the need to take sweeping measures to guarantee international security without delay. Under the new strategic conditions, the United States and USSR should already be prepared to neutralize the possible risk of the use of nuclear missiles by third countries and to minimize the possible danger to the security interests of the two superpowers and their allies.

The creation of the nuclear risk reduction centers approved by R. Reagan and M. Gorbachev at the summit meeting in 1988 could be interpreted as an acknowledgement of the need to contain any risk of nuclear conflict. But what are these centers actually doing? Do they actually exist only on paper? We have not seen any positive information about the results of their activity yet.

It seems that one of the main functions of the centers should consist in helping to prevent the use of nuclear weapons in conflicts started by "near-nuclear" or "underground" nuclear countries. It is probably time to arrange for the establishment of a similar all-Europe center for the reduction of the nuclear threat, in which England and France would participate along with the United States and the USSR.

Another matter warranting discussion is the creation of a precise ballistic missile defense system for the "common European home," capable of protecting it from the ballistic missiles launched in crisis zones. The NATO countries and the USSR could take part in this initiative. In spite of all the negative feelings about the SDI, there might be no other way to neutralize the missile threat posed by new members of the "nuclear club." The main thing is to keep this problem from turning into an excuse for military competition between the United States, USSR, and Europe on one side and the "Third World" on the other. Besides this, it is already time to let the new members of the "missile club" know during discussions of the matter that reliance on nuclear missiles is counterproductive.

A BMD system could be installed along the southern perimeter of the European continent. Of course, this will require a high level of military and political cooperation by the United States, USSR, and Europe. In the interest of security, it would probably be best to agree as quickly as possible to all types of new security structures, even those involving USSR participation in the Atlantic alliance. When people argue that all of this is unrealistic and that neither side—neither the East nor the West—is ready to give up its own autonomous military structures for the sake of cooperation in mutual security spheres, they should receive this response: We have heard enough of this kind of talk. Open your eyes and look at the speed with which weapons of mass destruction are being stockpiled in the "Third World" countries, creating the danger that the nuclear powers and the leading developed countries will be subjected to constant blackmail by nuclear pygmies in the 21st century. Collective defensive measures must be taken to prevent the kind of strategic chaos the world could suffer as a result of the proliferation of nuclear missiles.

The United States and USSR are certain to face a historic choice by the beginning of the 21st century: The two countries can either quickly rebuild their military and political relations for the effective prevention of the spread of nuclear weapons or they can be among the first victims of this rapid proliferation. Of course, human thinking does not keep up with changing reality. This is precisely why efforts must be made to break through the traditional approaches and mental stereotypes that still affect the policies of Washington and Moscow. It would also be useful to arrange for broad discussions of effective solutions to the proliferation problem on the highest level without delay. Interaction in this sphere would be promoted by the creation of a permanent joint commission of American congressmen and USSR Supreme Soviet deputies, which would conduct regular hearings on nuclear nonproliferation issues and advise the two governments. The idea of creating a similar trilateral (United States, USSR, and European countries) commission on nonproliferation and the organization of hearings of this kind in the European Parliament also seems productive.

The euphoria aroused by the positive changes in Europe should not obscure the threatening challenge the entire international community faces as a result of the uncontrollable spread of nuclear missiles and other weapons of mass destruction in the "Third World." The United States and USSR will have to take quick and effective measures to solve this most acute problem of international security.

Footnotes

1. L. Spector, "The Undeclared Bomb," New York, 1988, pp 70, 181, 293.

2. IZVESTIYA, 13 June 1990.

3. "Postures for Non-Proliferation," London, 1979, p 3.

4. L. Dunn and J. Tomashoff, "New Technologies and the Changing Dimensions of Third World Military Conflict," CNSN Paper, vol 2, No 1, 1990, pp 14-18.

5. Quoted in IZVESTIYA, 18 June 1990.

6. "SIPRI Yearbook 1990. World Armaments and Disarmament," Stockholm, 1990, pp 369-372.

7. W. Donnelly and L. Scheinman, "New Concepts in Nuclear Arms Control. Verified Cutoff and Verified Disposal," Southampton, 1990.

8. J. Nye, "Arms Control After the Cold War," FOREIGN AFFAIRS, Winter 1989/90, p 62.

9. In October 1990, for example, the LOS ANGELES TIMES reported that President G. Bush did not try to assure Congress that Pakistan "has no nuclear explosive devices"—the stock assurance needed for the continuation of American military shipments to Islamabad. The same newspaper printed an editorial under the more than eloquent title "Pakistan Joins the Club of Atom Bomb Owners" (LOS ANGELES TIMES NEWSFAX, 26 October 1990).

Computer Analysis of Strategic Stability: 'ASK' System

914K0018B Moscow SSHA: EKONOMIKA, POLITIKA, IDEOLOGIYA in Russian No 2, Feb 91 pp 25-39

[Article by Vladimir Pavlovich Akimov, candidate of physical-mathematic sciences a nd senior scientific associate at Institute of U.S. and Canadian Studies]

[Text] One of the central problems of the radical reduction of nuclear arms and the reduction of the military potential of the sides to the level of reasonable sufficiency consists in defining the exact composition of strategic offensive arms (SOA) that would secure the maximum stability of the military-strategic balance.

This presupposes extremely serious efforts in the creation of instruments for the analysis of strategic stability, the kind of simulations and software that would be universal enough for the analysis of a broad range of situations by facilitating the examination of changes in their distinctive parameters.

The creation of a interactive system equipped with "intellectual potential" (equipment for the editing of data, the choice of optimal versions of interaction in situations of given parameters, etc.) and allowing for the simulation of possible patterns of strategic development for a quan titative analysis of stability seems appropriate.

This kind of interactive model, equipped with conceptual and mathematical media, was developed in the Institute of U.S. and Canadian Studies at the request of the Committee of Soviet Scientists in Defense of Peace

and Against the Nuclear Threat.[1] Only the data in unclassified literature were used in the study, and for this reason the research findings should be viewed as highly credible points of reference rather than as the absolute truth.

Balance of Power and Stability

In reference to the military-strategic balance, the concept of stability signifies "primarily the degree of probability of the start of nuclear war at a given correlation of military (mainly strategic) capabilities on both sides. The stability of the balance also depends on the parameters determining the ease with which one side can disrupt the balance and achieve superiority and the difficulty the other side will experience in neutralizing these move s with countermeasures and subsequently restoring parity."[2]

This description contains at least three major components of the concept of "stability." The first is the **balance of power**—i.e., the situation in which neither side will gain an advantage from aggressive action. The second is the **stability of the balance**—i.e., the situation in which minor changes in the composition or features of SOA will not change assessments or disrupt the balance. The minimum c hanges in the correlation of forces that will disrupt the balance could be associated in this case with reserve stability. Finally, the outbreak of war is a direct result of a decisionmaking process, which cannot be completely predetermined because it depends on people. An analysis of the correlation of strategic forces and their capabilities is important, but it is far from the only factor influencing this process.

Besides this, we cannot dismiss the purely human ability to make decisions und er stress that would not seem rational in a calmer atmosphere. All of this means that we can only discuss the probability of the start of a war that can be influenced by specific changes in the structure of SOA.

The influence of the human factor on the outbreak of war will not be analyzed in this article. We will concentrate only on the main security factors lending themselves to simulation and formal analysis: the balance of strategic forces and its stability.

The concepts of the balance o f power and stability are kept more or less separate in the "ASK" system. The stability of strategic offensive arms depends on the quantity, distribution, and tactical and technical characteristics of various systems in use and on many other factors. These parameters are subject to change. It would be impossible, for example, to change the factor of scientific and technical progress by means of a conscious decision. Not all components of the situation determining the degree of stability can be negotiated, and the verification of the fulfillment of agreements is not always reliable.

Given the current levels of strategic offensive arms, it is common opinion that reserve stability is several times in excess of the necessary minimum, and there is less concern for this aspect. Under the conditions of the radical reduction of nuclear arms, however, the assessment of possibilities for the disruption of the balance by natural or artificial changes in the factors determining stability acquires

considerable importance. Each side must be certain that technological breakthroughs or other factors will not disrupt the balance—i.e., that reserve stability is sufficient.

Criterion of Balance of Power

When we speak of a balance of power, we are referring to a situation in which neither side can gain decisive military-strategic advantages, including its own security, as a result of a first strike. This is sufficient reason for both sides to feel that the use of strategic weapons wou ld be inexpedient.

Assessments of the military-strategic expediency of a first strike depend largely on the consequences of the probable response. Furthermore, the degree of risk for the aggressor depends largely on the choice of targets for SOA in a counterstroke.

G.K. Lednev[3] distinguishes between two alternative strategies of the counterstroke: **counterforce**, or the achievement of parity on another, lower level, and **retaliation**, which would include strikes at non-military targets and would imply mutual annihilation. In his article he presents strong arguments in favor of the counterforce strike, including the tendency toward the higher accuracy and lower yield of the warheads of modern strategic offensive weapons.

Now that the reduction of nuclear arsenals has begun, the concept of stability based on deterrence by means of the threat of retaliation is obsolete. The conditions of stability demand that both sides have sufficient numbers of nuclea r weapons. Consequently, the need to inflict unacceptable damage in the counterstroke erects a barrier to their reduction. This concept is obviously groundless at a time of radical reductions in nuclear arms, when the fear of nuclear retaliation begins to disappear. The maintenance of stability at low levels of nuclear confrontation will necessitate the revision of this concept, specifically for the purpose of creating the kind of structure of forces that would guarantee the impossibility of a f irst strike because of its inexpediency. The sides must be put in a position in which the instigator will lose.

To evaluate the advantages and disadvantages of a counterforce strike, American researcher L. Finch proposed the "cost of attack" index,[4] measuring the cost of destroying a unit of the opponent's SOA. The numbers of spent and destroyed warheads usually coincide. To produce military advantages, the counterforce strike must be distinguished by a low (below 1) cost of attac k. In other words, it must be extremely cost-effective.

Given the present structure of SOA, a counterforce retaliatory strike is unrealistic. From the standpoint of cost effectiveness, the most appealing targets of attack are those which are not hardened and which have multiple reentry vehicles, including most of today's counterforce systems. From the standpoint of the need to secure military superiority and the maximum survival of forces not used in the first strike, these are precisely the systems that should be used first in an attack. Consequently, the possibility of a counterforce retaliatory strike is automatically minimized.

Therefore, the concept of counterforce cannot work today. Will it be possible to have the kind of composition of SOA in the future in which stability will be regulated by the counterforce capabilities of the sides? This also seems doubtful because a counterforce retaliatory strike is only possible when the attacking side leaves this option open.

The main method of heightening stability today consists in bringing the average cost of attack for both sides to a figure exceeding 1. This might mean the renunciation of MRV in the case of ICBM's (the kill probability is always less than 1 for single-warhead missiles), or a move to mobile systems with considerable survival potential.

The condition of a "cost of attack exceeding 1" is generally used as a synonym for stability.[5] There are questions, however, about how much in excess of 1 the cost of attack should be in order to guarantee stability. Let us examine the extreme case in which it is equal to 1. We will assume that each side has 100 ICBM's, each of which is capable of destroying an enemy missile with a probability equivalent to 1. Could this situation be called stable? In an attack the 100:100 correlation of forces would change to 0:0. There would be no gain in warheads. This "exchange," however, would not be equivalent to the simple reduction of nuclear arsenals. After all, a great deal depends on the territory where this takes place. We have to consider the 100 epicenters of the nuclear blasts, the destruction of costly military-technical installations (silos), and the inevitable losses of military personnel and skilled maintenance personnel. If the two sides should resume the production of ICBM's in the future, one would be able to quickly deploy the new missiles in existing silos and man them with trained maintenance personnel, but the other side wo uld not. All of this indicates that the two sides would not necessarily view a first strike as something absolutely pointless in this kind of situation.

The fact that the cost of attack should exceed 1 is self-evident, but by how much? The attacked side should have a tangible preponderance of forces which either cannot be used in a counterforce strike (if the attacking side uses all of its forces) or cannot produce a comparable impact if used. The only alternative is to use surplus strength in a countervalue strike. The damage inflicted in this case will exceed the losses resulting from a counterforce strike several times over. This points up the **criterion of stability for a situation with a high cost of attack: the possibility of delivering a limited countervalue retaliatory strike causing damage surpassing or comparable to the damage caused by the first counterforce strike with the consequent surplus of forces.** This should not be viewed as an actual scenario of the sit uation. This is only an appropriate way of proving the futility of a counterforce first strike.

The compensatory criterion of stability described above is one of the important theoretical principles used in the development of the "ASK" system. It was introduced into the program as the coefficient k, corresponding to the level of damage caused by the use of SOA in the countervalue and counterforce versions. It would be difficult to calculate the actual value of this coefficient, but this does n ot exclude the possibility of its approximate assessment.

The mathematical formula of the criterion is the following. Let side **S1** use **A** warheads in the attack, after which side **S2** will have an advantage amounting to **D** warheads, which is completely realistic because the cost of attack exceeds 1. Then the condition of stability will be **A kD.**

Summing up some of the results, if the composition of SOA is distinguished by high costs of atta ck, the side making the decision to deliver a strike has two possibilities: the counterforce and countervalue versions of using its SOA. The countervalue version is senseless because it leaves the possibility of an equivalent enemy response possible. The futility of a counterforce strike can be judged by the compensatory criterion of stability. It is significant that this criterion works at any level of confrontation, even the lowest (excluding other sides possessing nuclear potential and conve ntional arms), but only on the condition that the cost of attack is high. Although the criterion originally applied to nuclear confrontation, it is also fully applicable to conventional arms.

"ASK" Interactive System

The "ASK" interactive system was developed not only to simplify computations and evaluations for specialists in arms control, but also to transfer some analytical functions to the computer so that this could also be done by a user without any specialized knowledge in this fie ld.

Therefore, the "ASK" system is comparable in some respects to an expert system. Furthermore, the system uses ordinary language: The situation is described in terms of the number of weapons, the parameters of missile defense and air defense systems, etc. The results of the analysis of reserve stability are reported in the same terms. The user is relieved of many technical details and conducts a dialogue with the computer in a language close to natural speech.

Principles of calcula tion: The "ASK" system is intended to analyze any possible future configurations of strategic forces. There is an index in the database for each type of weapon. Calculations of kill probability depend on the

types of targets and attacking warheads. The system distinguishes between four main types of weapons: ICBM's, SLBM's, mobile missiles, and strategic aviation. There is also a modifier for cruise missiles.

For ICBM's deployed in silos, kill probability is calculated with the follow ing formula[6]:

where **S1** and **S2** stand for the indices of the sides, **a** stands for the index of the attacking warhead, **r** stands for reliability, **Y** stands for yield (megatons), **CEP** stands for radius of circular error probability (kilometers), **g** stands for the index of the goal, and **H** stands for hardening (psi).

In the case of mobile systems, kill probability is the rel ationship between the casualty zone and the territory of their deployment. The size of the casualty zone at the optimal blast height is the following[7]:

In the case of the two other components there is the assumption that if the bases are destroyed, all of the forces deployed on them will be lost, but the forces on alert will survive.

In all cases, kill probability is modified by the pass factors of BMD and air defense systems with consideration for the possible use of antisubmarine operations.

Structure of "ASK" System: The macrostructure of the "ASK" system is illustrated in the flowchart (Figure 1). The main management module conducts the dialogue with the user, controls the work of the system, and simultaneously controls the specialized data base. The work with the information is simplified by a graphics module, constructing diagrams of the distribution of weapons among the main components of SOA. The rest of the modules serve analytical purposes. The kill probability computation module calculates the probability for all of the possible pairs of opposing weapons. Two modules verify the presence of military-strategic stability by calculating the balance of power that might be created by a hypothetical nuclear strike and analyze reserve stability for each type of weapon.

During the calculation of the balance of power, the syst em constructs graphs of the correlation of forces, depending on the quantity of weapons used in the first strike. It also defines the final correlation of forces following an optimal strike and retaliatory capabilities. During the evaluation of reserve stability, the system "probes" the parameters distinguishing the quantitative composition of the SOA of the defensive side to determine the exact amount of reduction (or increase) that will cause the opponent's incentive for a first strike to appea r (or disappear). Depending on the cost of attack, the system will focus either on the criterion of unacceptable losses in a retaliatory strike or on the compensatory criterion.

The variations are not simultaneous for all types of SOA; individual variants are calculated for each. The reason is that it would be difficult to use a specific gradient of increase or decrease which would apply to all types of weapons. Because of this, the analysis is more informative at lower levels of confrontatio n, when the line of stability is crossed following specific changes in the quantitative composition. In this case the amount of the decrease or increase also provides a comparative evaluation of the contribution of various weapons to stability. The result is a "portrait" of the situation in the form of

Figure 1. Macrostructure of "ASK" System

a histogram of the necessary increase for an unstable situation or reserve for a stable one.

In this way, the model and the "ASK" interactive system based on it simplify the manipulation of the parameters of the situation and the quick analysis of its stability, even in the case of low thresholds of confrontation.

Index of Stability

Because the cost of attack does not satisfy the condition of stability at the present level of nuclear confrontation, the criterion of deterrence through the threat of retaliation is still effective. Its drawbacks were listed above. In addition, the use of the concept of retaliation as a basis provides for only a binary assessment of stability: Ei ther it exists or it does not. To determine ways of heightening stability, there must be differing degrees of preference for all of the conceivable opposing arms structures. The most natural way consists in the comparison of the final capabilities of the sides' forces following hypothetical first strikes.

A more precise method is demonstrated in the work by A. Arbatov and G. Lednev,[8] where the index of stability is the reciprocal of the sum of the motives of sides A and B to deliver a first strike:

$$St = 1/(M(A) + M(B)),$$

where the motive **M(A)** of side **A** to deliver a strike (A against B) depends on the coefficients of the effectiveness of the strike and the final correlation of forces:

$$M(A) = K\ ef/K\ fin$$

K ef = (destroyed B forces)/(spent A forces)

K fin = (B forces after strike)/(A forces after strike)

All of the quantitative features of arms are calculated on the basis of the standard first s trike scenario, which secures comparable results.

Soviet researchers have repeatedly underscored such important features of strategic stability as the incalculable difficulty and even the impossibility of achieving it in a unilateral manner and the need for mutual effort to secure it.[9] The definition of the index of stability satisfies the demand for mutuality.

Despite the obvious merits of this approach, it also has some drawbacks. Above all, the coefficients of effectiveness and the final correlation of forces are not independent: The higher the effectiveness of the first strike, the better the final correlation of forces for the attacker. After conducting some simple transformations, we can prove that the motive can be reduced to the correlation of forces before and after the strike. If we assume that the enemy's forces before the strike are **AF** and **BF**, and the forces after the strike are **AF1** and **BF1**, then the following formu la is a simple function of relative force reductions.

The motive is calculated on the basis of the consequences of only the side's own strike, but it also depends on assessments of alternative chains of events—possible mutual deterrence or an enemy attack. Furthermore, the assessment of the consequences of a first strike should be based less on the quantity of arms remaining than on their capabilities, particularly their retaliatory potential. The McNamara cri terion was one of the first attempts to assess precisely this kind of potential for a retaliatory strike.

Another method of determining the index of stability deserves consideration. It would be completely free of calculations based on specific scenarios, and would rely only on the general principles of the probable use of SOA and on the correlation of the offensive and defensive resources of the sides, including the potential for a counterstroke.

The need to include the defensive resources o f the sides in assessments of stability can be illustrated by the following example. Let us assume that side **A** has 100 single-warhead ICBM's with a kill probability of 0.5 for enemy silos, and side **B** has 10 ICBM's with 10 warheads each and with a kill probability of 0.9. Obviously, side **B's** destructive potential is far in excess of side **A's**, but the higher number of targets (silos) on **A's** territory cancels out this advantage by increasing its

defensive capabilities. Side **B** has more modern weapons but cannot achieve superiority with a first strike, while side **A**, after using 20 ICBM's (2 for each silo), can change the correlation of forces in its own favor—80:25.

How can we obtain an integrated expression of the correlation of the offensive and defensive capabilities of the sides? The stability of SOA can be expressed in a vector with two components (with **A** representing the attacking side):

Because stability is a mutual state, it can be measured by the length of the vector—for example, of the index of stability:

securing the possibility of comparison.

Stability St (the reciprocal of the index of stability) grows as the length of the vector is reduced—i.e., as defensive capabilities increase and attack potential decreases. If both coordinates of the vector are less than 1 (if defense is stronger than attack), th ere is a state of absolute stability.

How should potential be measured? Because the counterforce capabilities of weapons depend on the yield and accuracy of warheads, the most convenient unit of measurement is the function of these figures. In line with A. Karkoszka's method,[10] we will define destructive potential as

$$DSP = Y^{(2/3)}/(CEP^2),$$

and defensive potential—i.e., the potential which must be used to destroy a hardened target with a given leve l of probability **p**—as

Assuming a standard level of kill probability (see below), with consideration for the lessening of destructive potential by the limited reliability of counterforce systems, as well as BMD, air defense, and other systems, we can sum up both types of potential and obtain a correlation (1). These considerations are applicable to ICBM's, but other components of the triad are less vulnerable. If they are included, formula (1) has to be modified, namely by adding the potential for retaliation to defensive potential:

In this form formula (2) can be used to assess the stability index with an arbitrary arms structure. One of its drawbacks is that the potential for retaliation has to be measured in the same units as offensive potential—i.e., it has to be expressed as the ability to destroy superhardened targets. Because this does not correspond fully to the concept of the retaliatory strike, a nd because the damage caused by the countervalue use of SOA is much more perceptible, it is best to use the factor **k** in this case as well to show how many times the damage caused by the countervalue use of SOA exceeds the damage of a counterforce strike with the use of the same SOA.

Therefore, formula (2) is an attempt at a qualitative assessment of stability, comparing the capabilities of the "sword and shield" and not requiring detailed numerical calculations. This attempt correspon ds to the belief that when strategic stability is being defined, "a significant role is played by the relationship between all of the different offensive weapons of the sides and between offensive and defensive weapons—for the opposing sides and within the armed forces of each."[11]

Assessment of Consequences of SOA Reductions

The treaty on the 50-percent reduction of SOA naturally gives rise to questions about its effect on strategic stability. The rules governing the reducti on process will leave both sides considerable freedom of choice in defining the final composition of arms. Considerations of strategic stability will probably not be the only reason for the choice of a reduction strategy. Other factors which might be taken into consideration are the hope of modernizing SOA—i.e., replacing outdated systems with more modern and reliable ones—and other factors, including the cost of specific reduction options. According to S. Kortunov, the draft prepared in Genev a did inherit some of the drawbacks of earlier approaches to arms limitation, such as the primarily arithmetical nature of reductions and limitations, the hope of modernizing SOA, and the "emphasis on the preservation of the present, far from optimal structure of SOA at lower quantitative levels."[12]

Some alternative reduction strategies will be examined below from the standpoint of their effect on the stability of the military-strategic balance. The first three were taken from the wo rk by May, Bing, and Steinbruner.[13] The point of departure in their work was approximately equivalent to the present composition of SOA. Version A corresponds to the proportional reduction of SOA from the basic point of departure, version B increases the percentage of mobile missiles and SLBM's, and version C envisages the modernization of SOA with equal shares of warheads on mobile and silo launchers.

Because the least expensive versions are certain to entail the simple reduction of the present level, without any modification or re-equipping of SOA, versions D and E are also examined. Version D corresponds to the maximum reduction of obsolete systems, without their replacement by new ones (the modernization strategy version), and version E focuses on the reduction of the most destabilizing systems (tables 1 and 2).

Table 1. Models of U.S. Strategic Forces

	Basic version		A		B		C		D		E	
Systems	DV*	WH**	DV	WH	DV	WH	DV	WH	DV	WH	DV	WH
Minuteman 2	450	450	250	250							450	450
Minuteman 3	250	750										
Minuteman 3A	300	900	250	750					475	1425	171	513
MX							50	500	50	500		
Midgetman					1000	1000	500	500				
All ICBM's	1000	2100	500	1000	1000	1000	550	1000	525	1925	621	963
ICBM launch silos	1000	2100	500	1000	0	0	50	500	525	1925	621	963
Poseidon C-3	288	2880	144	1440					180	1440	240	2400
Trident C-4	360	2880	192	1536	360	2880			192	1536	192	1536
Trident D-5							360	2880				
All SLBM's	648	5760	336	2976	360	2880	360	2880	372	2976	432	3936
B-52G (ALCM)	180	2160							60	1200	60	1200
B-1			101	2020	106	2120	106	2120	20	400	15	300
B-52H									120	960	125	1000
All bombers	180	2160	101	2020	106	2120	106	2120	200	2560	200	2500
All SOA	1828	10020	937	5996	1466	6000	1016	6000	1097	7461	1253	7399

* DV—delivery vehicles. ** WH—warheads.

Table 2. Models of USSR Strategic Forces

	Basic version		A		B		C		D		E	
Systems	DV	WH	DV	WH	DV	WH	DV	WH	DV	WH	DV	WH
SS-11	448	448	200	200							135	135
SS-13	60	60									60	60
SS-17150	600	100	400					95	380	150	600	
SS-18	308	3080	156	1560			100	1000	154	1540	125	1250
SS-19	360	2160	180	1080	180	1080			200	1200		
SS-24												
SS-25	70	70	90	90	990	990	1000	1000	72	72	72	72
All ICBM's	1396	6418	726	3330	1170	2070	1100	2000	521	3192	542	2117
ICBM launch silos	1326	6348	636	3240	180	1080	100	1000	449	3120	470	2045
SS-N-6	304	304									304	304
SS-N-8	292	292									280	280
SS-N-17	12	12										
SS-N-18	224	1568	160	1120					112	784	200	1400
SS-N-20	80	640	80	640	80	640	80	640	80	800	80	800
SS-N-23	32	256	80	640	272	2176	272	2176	32	128		
All SLBM's	944	3072	320	2400	352	2816	352	2816	224	1712	864	2784
Bear	110	220							100	200	100	200
Bear H	40	160	66	264					40	160	40	160

Table 2. Models of USSR Strategic Forces (Continued)

	Basic version		A		B		C		D		E	
Bison	30	120							20	80	20	80
Blackjack					55	1100	60	1200				
All bombers	180	500	66	264	55	1100	60	1200	160	440	160	440
All SOA	2520	9990	1112	5994	1577	5986	1512	6016	905	5344	1566	5341

Because the results of simulations measuring the capabilities of the sides in the first strike and counterstroke are presented in sufficient detail in the previously mentioned American work, in this article we will concentrate on calculating the i ndex of stability for the different versions.

The basic premises will be the following. There will be no deployment of broad-scale ballistic missile defense on either side. The effectiveness of BMD in a massed attack is estimated at 5 percent for the United States and 30 percent for the USSR. The attempt at a disarming strike will be a surprise attack—i.e., the attacked side will be in a state of ordinary combat readiness (not red alert). The percentage of submarines on alert will be 60 for the United States and 30 for the USSR. The figures for strategic aviation will be 33 for the United States and 15 for the USSR.[14] Antisubmarine operations are not envisaged. Mobile missiles will be on permanent-site launchers, securing reliable communications, and at the sound of the alert will move away from them to a distance depending on the amount of time they have and the speed with which launchers can be moved. In line with the numerical values of these parameters,[15] the "take-off" radius will be equivalent to 4.7 km for Midgetman missiles and 3.5 km for the SS-25's. For the guaranteed destruction of mobile launchers, the attacking side should exert additional pressure, sufficient for their destruction, in the corresponding zone.

In calculations of the defensive potential of silo launchers, their kill probability will be assumed to be 0.9. This figure is reached in the following manner. We begin by calculating the attack potential of the ICBM in a si lo, the potential needed for its destruction with a given probability **P**, and the probable potential for retaliation, equivalent to its initial potential multiplied by the probability of survival (**1-P**). We then compare the offensive and defensive capabilities of ICBM's by correlating the attack potential of the ICBM with the sum of defensive potential and retaliation potential. If the correlation is greater than 1, this can be interpreted as optimal kill probability. Table 3 , listing two types of ICBM's for both sides, shows that increasing the kill probability for ICBM's to exceed 0.9 entails difficulties for the attacking side. The only exception is the MX missile, representing an extremely appealing target and justifying virtually any expenditures for the enhancement of kill probability. This attests to its destabilizing effect on the strategic situation. In general, the index measuring the correlation of the offensive and defensive capabilities of a specific we apon could be an important factor in the choice of a reduction procedure for the purpose of heightening strategic stability.

Table 3. Correlation of Offensive and Defensive Capabilities of Some ICBM's with Different Rates of Kill Probability

ICBM's	0.8	0.85	0.9	0.95
Minuteman 3a	1.24	1.16	1.04	0.85
MX	3.93	4.68	5.63	6.63
SS-18	1.66	1.61	1.48	1.26
SS-19	1.21	1.12	1.00	0.82

When de structive potential is being calculated, other characteristics of SOA, such as the yield and accuracy of the warhead, are taken into account, but delivery time is not taken into account although it can play a significant role in simulations of a surprise attack. Strategic aviation is the slowest of all the components of the nuclear triad, and the full-scale use of its potential in a surprise first strike seems implausible. Some of the latest systems (bombers built with the use of the Stealth tech nology and air-launched cruise missiles), however, could pose a definite threat in this context.

Therefore, two basic options were examined. Table 4 presents the results of the analysis presuming that strategic aviation will not be used to a considerable extent in the first strike. In this case only one-tenth of it is included in calculations of first-strike potential, but all of it is included in calculations of counterstroke potential. Table 5 presents calculations based on the assumption th at air-launched cruise missiles will be used, and their potential is included in the attack potential of the first strike. All of the calculations were based on a counter-value/counterforce correlation equivalent to 1 (coefficient k in formula (2)).

Table 4. Strategic Potential of USA/USSR and Stability Indices (strategic aviation not used in first strike)

U.S./USSR	Delivery vehicles	Offensive potential	Defensive potential	Retaliation potential
ICBM launch silos	1000/1326	18101/44138	19583/29686	1810/4414
Mobile ICBM's	0/70	0/1038	0/4224	0/0
SLBM's	648/944	4018/3522	1170/116	2411/1057
Strategic aviation	180/180	5426/1866	2924/412	17907/2800
Total	1828/2520	27546/50565	23776/34437	22128/8270
Basic version				
U.S. attack—0.645	USSR attack—1.104		Index of stability—1.279	
ICBM launch silos	500/634	8547/22700	9574/15072	855/2270
Mobile ICBM's	0/90	0/1335	0/5430	0/0
SLBM's	336/320	2096/2454	1170/116	1258/736
Strategic aviation	101/66	4776/1694	2924/412	15761/2541
Total	937/1110	15419/28183	13668/21030	17873/5548
Version A				
U.S. attack—0.580	USSR attack—0.894		Index of stability—1.065	
ICBM launch silos	0/180	0/6847	0/6142	0/685
Mobile ICBM's	1000/990	32420/14685	206892/483875	0/0
SLBM's	360/352	2605/1103	269/504	1563/331
Strategic aviation	106/55	5013/3530	671/1801	16541/5295
Total	1466/1577	40037/26164	207832/492322	18104/6310
Version B				
U.S. attack—0.080	USSR attack—0.116		Index of stability—0.141	
ICBM launch silos	50/100	24051/8567	1865/3412	2405/857
Mobile ICBM's	500/1000	16210/14833	148962/488763	0/0
SLBM's	360/352	93 371/1103	363/504	56022/331
Strategic aviation	106/60	5013/3851	907/1801	16541/5776
Total	1016/1512	138644/28353	152097/494480	74969/6963
Version C				
U.S. attack—0.276	USSR attack—0.125		Index of stability—0.303	
ICBM launch silos	525/449	36959/23253	13025/14310	3696/2325
Mobile ICBM's	0/72	0/1068	0/12288	0/0
SLBM's	372/224	2691/1802	1170/140	1615/541
Strategic avia tion	200/160	4140/1718	2924/503	13661/2577
Total	1097/905	43790/27841	17119/27242	18971/5443
Version D				
U.S. attack—1.34	USSR attack—0.771		Index of stability—1.546	
ICBM launch silos	621/470	7802/14642	10678/9083	780/1464
Mobile ICBM's	0/72	0/1068	0/4344	0/0
SLBM's	432/864	2567/3163	1170/116	1540/949
Strategic aviation	200/160	4124/1718	2924/412	13610/2577
Total	1253/1566	14494/20591	14772/13955	15930/4990
Version E				
U.S. attack—0.765	USSR attack—0.671		Index of stability—1.017	

Table 5. Strategic Potential of USA/USSR and Stability Indices (ALCM's used in first strike)

U.S./USSR	Delivery vehicles	Offensive potential	Defensive potential	Retaliation potential
ICBM launch silos	1000/1326	18101/44138	19583/29686	1810/4414
Mobile ICBM's	0/70	0/1038	0/4224	0/0
SLBM's	648/944	4018/3522	1170/116	2411/1057
Strategic aviation	180/180	54263/11108	2924/412	17907/2800
Total	1828/2520	27546/50565	23776/34437	22128/8270
Basic version				
U.S. attack—1.789	USSR attack—1.306		Index of stability—2.214	
ICBM launch silos	500/634	8547/22700	9574/15072	855/2270
Mobile ICBM's	0/90	0/1335	0/5430	0/ 0
SLBM's	336/320	2096/2454	1170/116	1258/736
Strategic aviation	101/66	47761/16943	2924/412	15761/2541
Total	937/1110	15419/28183	13668/21030	17873/5548
Version A				
U.S. attack—2.197	USSR attack—1.377		Index of stability—2.593	
ICBM launch silos	0/180	0/6847	0/6142	0/685
Mobile ICBM's	1000/990	32420/14685	206892/483875	0/0
SLBM's	360/352	2605/1103	269/504	1563/331
Strategic aviation	106/55	50126/35297	671/1801	16541/5295
Total	1466/1577	40037/26164	207832/492322	18104/6310
Version B				
U.S. attack—0.171	USSR attack—0.256		Index of stability—0.308	
ICBM launch silos	50/100	24051/8567	1865/3412	2405/857
Mobile ICBM's	500/1000	16210/14833	148962/488763	0/0
SLBM's	360/352	93371/1103	363/504	56022/331
Strategic aviation	106/60	50126/38506	907/1801	16541/5776
Total	1016/1512	138644/28353	152097/494480	74969/6963
Version C				
U.S. attack—0.366	USSR attack—0.277		Index of stability—0.460	
ICBM launch silos	525/449	36959/23253	13025/14310	3696/2325
Mobile ICBM's	0/72	0/1068	0/12288	0/0
SLBM's	372/224	2691/1802	1170/140	1615/541
Strategic aviation	200/160	25845/10960	2924/503	13661/2577
Total	1097/905	43790/27841	17119/27242	18971/5443
Version D				
U.S. attack—2.004	USSR attack—1.027		Index of stability—2.252	
ICBM launch silos	621/470	7802/14642	10678/9083	780/1464
Mobile ICBM's	0/72	0/1068	0/4344	0/0
SLBM's	432/864	2567/3163	1170/116	1540/949
Strategic aviation	200/160	25829/10960	2924/412	13610/2577
Total	1253/1566	14494/20591	14772/13955	15930/4990
Version E				
U.S. attack—1.911	USSR attack—0.972		Index of stability—2.144	

The data in tables 4 and 5 provide the grounds for several conclusions.

The assessment of the capabilities of the sides in the basic option reflects the asymmetrical development of the components of the strategic triad: When strategic aviation is not included, the correlation of attack and defense is higher in the case of a USSR attack, but the opposite is tru e if part of the strategic aviation is included.

Approximately proportional reductions (version A) will lead to slightly higher stability without the inclusion of aviation, mainly by lowering the attack potential of the USSR. The inclusion of aviation, however, leads to a slight increase in instability because it augments the value of U.S. air superiority.

Versions B and C are extremely auspicious from the standpoint of stability, and this is due to the strong stabilizing effect of mobile s ystems.

Version E is also quite appealing because it improves stability perceptibly and does not require large capital investments. Nevertheless, because it heightens stability by means of the primary reduction of the most destabilizing (and actually newest) systems, it presupposes the artificial obsolescence of arms and is probably unrealistic for this reason.

Version D, in which the sides get rid of obsolete systems without substituting newer ones for them, seems much more realistic. Calc ulations indicate that the fulfillment of all of the conditions of the treaty on the 50-percent reduction in SOA in this case could lead to a radical change of emphasis in estimates of the offensive and defensive capabilities of the sides. Without the inclusion of strategic aviation, for example, the correlation of the attack potential of the United States and the defensive capabilities of the USSR will rise from 0.645 in the basic version to 1.34 in version D, and the reverse correlation (USSR at tack/U.S. defense) will display a corresponding decrease from 1.104 to 0.771. In other words, from the standpoint of the threat of a surprise attack, the sides change places. The index of stability will rise from 1.279 to 1.546, attesting to the destabilizing effect of reductions. The result is extremely indicative because it agrees with the findings of other Soviet researchers. In particular, according to an analysis by M. Gerasev, after the completion of the 50-percent reduction the balance o f indicators of the survivability of strategic forces will shift perceptibly in the United States' favor.

Therefore, the most stabilizing influence will be exerted by versions with a higher percentage of single-warhead and mobile missiles. The same factor could play a positive role in future reductions of SOA. The inclusion of separate conditions in the treaty for a specific system (SS-18) is unlikely to set a good precedent. Conditions of this kind should apply to whole groups of systems on b oth sides with the strongest destabilizing effects. Otherwise, there could be a result similar to the one we saw in version D, but on an even broader scale. Besides this, the simpler wording of an SOA treaty, pertaining only to the number of warheads, regardless of the number of delivery vehicles, would eliminate the need for individual considerations of destabilizing systems. If the same number of warheads is distributed among a higher number of delivery vehicles (for a higher number of targets), the cost of attack will rise (along with defensive potential). For this reason, it will be simply inconvenient to keep systems with a high concentration of warheads on a single delivery vehicle.

The guarantee of lasting peace on earth in the presence of nuclear weapons is unlikely without an understanding of the meaning of strategic stability and the conditions excluding the possibility of using these weapons. Obviously, arithmetical computations and comparisons of quantities of nuclear war heads and delivery vehicles do not contribute to an understanding of the concept of stability. We must seek ways of reaching a consensus on this matter, and this article is regarded by its author as one such attempt.

Footnotes

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3. SSHA: EKONOMIKA, POLITIKA, IDEOLOGIYA, 1989, No 7, pp 6-7.

4. L. Finch, "Cost of Attack: Measuring How Strategic Forces Affect U.S. Security. A Methodology for Assessing Crisis Stability," CONGRESSIONAL RECORDS, vol 131, No 153, p S-15089.

5. Ibid., p S-15091.

6. M. Bunn and K. Tsipis, "Ballistic Missile Guidance and Technical Uncertainties of Countersilo Attack," Cambridge, 1983, p 58.

7. CONGRESSIONAL RECORDS, vol 131, No 153, p S-15093.

8. "Razoruzheniye i bezopasnost. Yezhegodnik IMEMO" [Disarmament and Security. IME MO (Institute of World Economy and International Relations) Yearbook], Moscow, 1987, pp 273-300.

9. A.G. Arbatov, A.A. Vasilyev, and A.A. Kokoshin, "Nuclear Weapons and Strategic Stability," SSHA: EKONOMIKA, POLITIKA, IDEOLOGIYA, 1987, No 9, p 10.

10. A. Karkoszka, "Strategic Disarmament, Verification and National Security," London, 1977.

11. SSHA: EKONOMIKA, POLITIKA, IDEOLOGIYA, 1987, No 9, p 4; MIROVAYA EKONOMIKA I MEZHDUNARODNYYE OTNOSHENIYA, 1985, No 5, p 34.

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13. M. May, G. Bing, and J. Steinbruner, "Strategic Arms Reduction," Washington, 1988.

14. Ibid., p 35.

15. Qin Zhongmin, "The Impact of Radical Reduction of Nuclear Weapons on Strategic Stability and the Prospects for Nuclear Disarmament," Prepared for Second Beijing Seminar on Arms Control, April 1990, p 22.

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[Text]

October

1—The first direct video conference betwe en the USSR and the United States, with AT&T executive S. Willcoxson and USSR Deputy Minister of Communications V.I. Glinka as the participants, was organized in New York. Constant video and audiovisual communications between Moscow and New York were secured with the aid of state-of-art electronic technology developed in the AT&T laboratories.

4—Soviet Foreign Minister E.A. Shevardnadze and U.S. Secretary of State J. Baker approved a joint Soviet-American statement on "the responsibility for peace and security in a changing world." It specifically stresses that the confrontation in East-West relations is giving way to cooperation and partnership. The United Nations is quickly becoming a genuine center of coordinated joint action, and the Security Council is reestablishing its decisive role in the maintenance of international security, the peaceful resolution of disputes, and the prevention of conflicts.

10—President M.S. Gorbachev of the USSR had a meeting in the Kremlin with Chairman D. Phelan of the New York Stock Exchange and executives of leading U.S. financial companies, D. Chalstey, W. Schreier, E. Peters, D. Bradford, D. Shields, and D. Feldman, who were in Moscow to attend a Soviet-American seminar on stock exchanges and their role in the functioning of financial markets.

15—M.S. Gorbachev received President Albert Reichman of the Olympia and York Company and the pension fund directors of the largest corporations in North America who had accompanied him to Moscow—P. Aldrich, R. Burns, T. Croft, R. Cavanaugh, W. Deck, D. Dutson, and others. The total capital in these funds amounts to around 3 trillion dollars.

In Moscow the executive director of the committee overseeing the fulfillment of the Helsinki accords, G. Leiber, had a meeting with Soviet journalists.

16—American Secretary of Defense R. Cheney came to Moscow as the guest of Marshal of the Soviet Union D.T. Yazov, USSR minister of defense. On 17 October he was received in the Kremli n by M.S. Gorbachev. That same day the U.S. defense secretary was received by E.A. Shevardnadze. The minister and secretary discussed aspects of military strategy.

17—A press conference for American and Soviet journalists was held in New York in the building of the USSR representation to the United Nations. The creation of an investment fund for the conversion of Soviet defense enterprises was announced. The corresponding declaration of intention was signed recently in Moscow by the Ameri can Batterymarch company and the Military-Industrial Commission of the USSR Council of Ministers.

19—George Bush received a special representative of the president of the USSR, member of the Presidential Council Ye.M. Primakov, in the White House. They discussed possible ways of settling the crisis caused by Iraq's aggression against Kuwait and the annexation of this Arab state.

M.S. Gorbachev had a meeting in the Kremlin with President T. Turner of the American TBS television company, th e initiator and organizer of the Goodwill Games, and with famous actress and public figure Jane Fonda. During their talk, they underscored the importance of the role of various public organizations and their activists in strengthening peace and establishing relations of friendship and partnership between nations.

29—The Committee on American-Soviet Relations advocated close U.S.-USSR cooperation in power engineering. The committee bulletin distributed on 28 October speaks of the reinforc ement of commercial ties with the Soviet side by American oil and gas companies.

November

1-6—Staffers of the USSR Supreme Soviet Secretariat and the U.S. Congressional Research Service attended a joint seminar on the information-analytical support of the activities of supreme legislative bodies.

7—James Baker arrived in Moscow on an official trip for talks with E.A. Shevardnadze. On 8 November the U.S. secretary of state was received by President M.S. Gorbachev of the USSR.

13-15—A Soviet-American conference on conversion, organized by the Institute of World Economy and International Relations of the USSR Academy of Sciences, the academy's Peace Institute, and the U.S. Council on Economic Priorities, was held in Moscow.

16—In New York the George Kennan Prize was awarded to member of the Presidential Council of the

USSR Ye.M. Primakov and American Senator W. Bradley "for outstanding efforts in the development of mutual understanding and cooperation between the Soviet Union and the United States." These words were included in the address of the American Citizens Exchange Council, the organization awarding the prize to the two politicians.

19-21—At a summit-level all-European conference in Paris, the countries party to the Conference on Security and Cooperation in Europe signed a treaty on conventional armed forces in Europe, a joint declaration of 22 states (members of the Warsaw Pact and NATO), and a final document—the Paris Charter for a New Eur ope. M.S. Gorbachev had a long conversation with G. Bush on 19 November at the end of the evening session of the Paris conference.

20—An exhibit of Gzhel ceramics and other valuable examples of the Russian applied arts opened in San Francisco and Oakland. The items will be sold at a charity auction to aid the inhabitants of Oakland who lost their homes as a result of the devastating earthquake in October 1989.

23—Deputy General Secretary of the CPSU Central Committee V.A. Ivashko rece ived U.S. Ambassador to the USSR J. Matlock at his request.

December

1—A large shipment of medicine and food was sent by plane from the United States to the USSR. The shipment, valued at 1.5 million dollars, was intended for the republic children's hospital and two orphanages in Moscow. The items were collected by a philanthropic public organization in New Canaan (Connecticut).

3—Soviet Deputy Foreign Minister A.A. Obukhov received Ambassador J. Matlock at his request. They disc ussed several current international issues of mutual interest.

4—M.S. Gorbachev received J. McManus, executive of the American Time-Warner Publishing Group, and M. Loeb, editor in chief of FORTUNE magazine, in the Kremlin. During their interesting and frank conversation, they discussed prospects for cooperation in the exchange of information and the development of Soviet-American commercial and social contacts.

10—President G. Bush had a meeting with Chairman V. Landsbergis of the L ithuanian Supreme Soviet.

10-12—E.A. Shevardnadze and J. Baker met for talks in Houston. They discussed a broad range of international issues connected with Soviet-American relations: arms control, regional issues, trade and economic cooperation between the USSR and the United States, and the status of the Soviet perestroyka.

19—The U.S. State Department withdrew its objections to the use of a Soviet satellite by the largest telephone company, AT&T, for the organization of another 100 channels of satellite communications between the USSR and the United States. There had been 130 up to that time.

23—Some 35 students from the Columbia University School of Business (New York) left for the Soviet Union. This is the first such trip in the history of this prestigious school for businessmen and managers. The students are taking the trip to learn more about the new possibilities of the Soviet market.

30—President G. Bush signed an executive order granting the Soviet Union a billion dollars in federally secured credit for the purchase of food and other agricultural products in the United States. The President's action effectively represented the official cancellation of part of the Jackson-Vanik amendment, which links the normalization of trade and economic relations with the Soviet Union directly with freedom to emigrate from the USSR.

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