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NUCLEAR WEAPONS, NUCLEAR WAR AND GLOBAL SECURITY: MAJOR TRENDS AND CONSEQUENCES

Introduction

On 7 December 1988, the General Assembly adopted resolution 43/75 N, the operative paragraphs of which read as follows:

The General Assembly,

"1. *Requests* the Secretary-General to carry out, with the assistance of qualified governmental experts and taking into account recent relevant studies, an update of the *Comprehensive Study on Nuclear Weapons* that provides factual and up-to-date information on and pays regard to the political, legal and security aspects of:

(a) Nuclear arsenals and pertinent technological developments;

(b) Doctrines concerning nuclear weapons;

(c) Efforts to reduce nuclear weapons;

(d) Physical, environmental, medical and other effects of use of nuclear weapons and of nuclear testing;

(e) Efforts to achieve a comprehensive nuclear-test ban;

(f) Efforts to prevent the use of nuclear weapons and their horizontal and vertical proliferation;

(g) The question of verification of compliance with nuclear-arms limitation agreements."

"2. *Recommends* that the study, while aiming at being as comprehensive as possible, should be based on open material and such further information as member states may wish to make available for the purpose of the study;"

“3. *Invites* all Governments to co-operate with the Secretary-General so that the objectives of the study may be achieved;”

“4. *Requests* the Secretary-General to submit the final report to the General Assembly well in advance of its forty-fifth session.”

The update of the 1980 study has been prepared against the background of important changes that have occurred in international relations in the last 10 years since its publication. They are characterised by the global quantitative and continued qualitative developments of nuclear weapons on the one hand and major breakthroughs in arms limitation and disarmament negotiations on the other.

On the technical level, research, development, production and deployment of new weapons have continued steadily, with the attendant introduction of more accurate nuclear ballistic missile systems and the deployment of highly accurate nuclear-armed cruise missiles. Accuracy, low yield and miniaturisation led to MIRVed (MIRV—multiple independently targetable re-entry vehicle) intercontinental ballistic missiles (ICBMs) and the development of new types of cruise missiles whether sea-, air- or land-launched-at relatively limited costs. The possibility of ballistic missile defence (BMD) technologies based on various concepts is also being explored.

In reviewing these developments, the study refers to figures, estimates and other data based on various open academic and other non-governmental sources. Some data are, however, officially published by nuclear weapon States, though such information is generally classified. The Governments of the respective nuclear weapon States do not necessarily concur with the data given by non-official sources.

In 1990, there are about 50,000 nuclear warheads deployed around the world on the territories of the nuclear weapon States and some non-nuclear weapon States, as well as on the high seas. Each of the two major powers has at least 10,000 nuclear warheads, which can be set into action in a major strategic attack within minutes or hours.

The possibility of the development of nuclear weapons by additional States also continues to be a deep concern. The Fourth Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons will take place at Geneva from 20 August to 14 September 1990. It is the last one before 1995, when a Conference will be held to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. In addition, there have been recent reports of more countries developing short- and intermediate-range ballistic missiles. These issues may be expected to gain rising attention in the forthcoming months and years of the new decade.

The end of the 1980s may have heralded an end to the cold war and the cresting of an escalating arms race that has prevailed for the 45 years since the Second World War. The growing *rapprochement* between East and West, movement towards settlement of various regional conflicts, important political changes in Europe and other regions of the world and the increasing involvement of the United Nations in major issues facing the international community create favourable opportunities for the pursuit of meaningful measures in arms limitation and disarmament. Indeed, major progress has been made in several areas, both bilaterally between the United States and the Soviet Union and between members of the North Atlantic Treaty Organisation and the Warsaw Pact. Although global stability and peace have not yet been attained, positive developments in international relations continue to gain momentum. These positive trends do not remove the need to continue the urgent search for solutions to regional problems in Asia and Africa so as to preclude the possibility of a conflict and, in particular, to prevent the use of weapons of mass destruction should a conflict nevertheless occur. This matter and its impact on global stability should be accorded the utmost importance.

In the same decade the first agreement providing for actual reductions in nuclear weapons, the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty), was signed in 1987. It provides for the elimination of a whole category of nuclear weapons under a system of unprecedented intrusive verification. This Treaty has paved the way for further progress on other arms limitation agreements.

The nuclear arms race may be turned around by the strategic offensive arms reduction treaty (START), the basic provisions of which were agreed to by the Soviet Union and the United States in June 1990. The international community has welcomed the agreement on the framework for such a treaty—which will reduce the Soviet and United States strategic nuclear weapons by approximately 30 to 35 per cent—as contributing to global security and as a step towards nuclear disarmament.

The continued improvement in international relations. particularly between the two major powers, the levelling off of the quantitative increases in the nuclear weapon arsenals, and the prospects for deep cuts all point to positive trends towards a less dangerous world. Although qualitative improvements in nuclear weapons continue and nuclear testing remains a contentious issue, the diminishing tension and the growing cooperation between East and West might facilitate the resolution of these issues as well. However, the possibility of the proliferation of nuclear weapons to additional States is of increasing concern. Some believe that the current political climate presents opportunities for taking steps that would minimise the chance or effect of possible untoward developments in the future.

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THE SWEDISH INITIATIVE ON ACCIDENTAL NUCLEAR WAR

The Initiative

Vastly improved East-West relations in the last few years have created better prospects for efforts with a view to common security and arms control agreements than ever before in the era following the Second World War. However, the danger of backlashes cannot be ignored.

An intentional war between the major nuclear weapon states seems unlikely today. Nevertheless, technological developments, dangerous military doctrines, proliferation of nuclear weapons to additional countries, and regional conflicts in strategically important areas combine to create the risk of an accidental nuclear war. An initiative to avert such a threat now seems both urgent and promising.

The aim of the Swedish Initiative is not to make nuclear weapons more acceptable, but to improve the possibilities for the survival of mankind pending the complete elimination of nuclear weapons.

Representatives of all six political parties in the Swedish Parliament and nine Swedish professional organisations against nuclear arms have founded the "Swedish Initiative for the Prevention of Accidental Nuclear War" with a view to promoting measures to reduce the danger that a nuclear war might break out accidentally.

Sweden has no nuclear weapons and does not belong to any military alliance. Still, there are good reasons why Sweden should take the initiative in this matter. Its geostrategic situation is strongly influenced by the deployment of nuclear weapons in nearby areas. Sweden has traditionally been ready to act as a mediator or to take initiatives in the area of multilateral arms control negotiations, as evidenced, for instance, at the Stockholm Conference in Security and Co-operation in

Europe (CSCE). Its policy of non-participation in alliances has given Sweden opportunities to act internationally, in ways that are not always open to other States. After a period of keeping a nuclear weapon option, Sweden decided, in 1968, to renounce this option and, following this decision, to accede to the Treaty on the Non-Proliferation of Nuclear Weapons.

The basic aim of the Swedish Initiative is to put the prevention of accidental nuclear war on the political agenda and to get things done in order to reduce the risks. For this purpose, an international conference was organised in Stockholm, from 14 to 16 November 1990, to design and present an "Action Programme" for reducing the risks of accidental nuclear war. Some thirty internationally renowned experts were invited to contribute to the Conference as consultants. They provided expert advice and a variety of proposals to the Swedish group, who finally formulated the programme. The Action Programme is addressed to the Swedish Parliament and Government as well as to other Governments, particularly those of the nuclear weapon States. The Action Programme proposes initiatives to be undertaken by the United Nations and in other international bodies.

The Conference was organised under the auspices of the Speaker of the Swedish Parliament and the Royal Swedish Academy of Sciences. Financial grants were received from the Swedish Ministry for Foreign Affairs. As a starting-point, the Conference discussed the evaluation of risks and considered the scientific aspects of the problem: possible sources of an accidental nuclear war, safety problems inherent in existing force structures and command-and-control systems. It also discussed a number of formulas for the prevention of accidental nuclear war. The main effort of the Conference was directed towards designing a combination of mutually reinforcing protective measures, which are effective in reducing risks, politically feasible and sufficiently verifiable. The Conference also discussed possible political procedures for having these measures implemented. A basic idea was to transform the accumulated scientific knowledge into a promising political initiative.

Initial Efforts to Prevent Nuclear War

Since the early days of nuclear weapons the established nuclear weapon States have had a common interest in avoiding any unauthorised or accidental use of nuclear weapons. Many safeguards have been introduced, either unilaterally or by bilateral (or in some cases multilateral) agreement.

The nuclear warheads themselves have been designed to preclude the possibility of accidental detonation as a result of exposure to mechanical damage, heat, blast or radiation. However, the degree to which that is true in countries other than the United States is largely undocumented. For the United States, detailed information has been made available, and some of it is very disquieting. Not all existing nuclear weapons satisfy the fundamental requirement that a full nuclear yield should be impossible in an aircraft crash or fire.

Technical designs and standard operating rules have been developed to preserve effective control over globally dispersed procedures that are routine in peacetime. These efforts have been successful in the sense that no accidental or unauthorised nuclear weapon explosion has occurred so far. The control, at least the first use, of any nuclear weapon has been highly centralised in all countries concerned. Complex procedures have been developed to secure continuous contact and authentic messages. Nuclear Weapon States have instituted special controls for weapons deployed outside their own territory. Weapons equipped with the permissive action links (PALs) system cannot be used unless they have received a highly secured coded signal from the highest political level.

The military take special precautions to screen those individuals who have access to nuclear weapons. In 1963 the “hot line” between Moscow and Washington was established, after the Cuban missile crisis, in order to reduce the risk of nuclear war by accident, miscalculation or failure of communication. It has been improved and updated with new technologies a number of times.

Several additional agreements between the Soviet Union and the United States have been concluded to reduce the risk of inadvertent military confrontation and nuclear war. These agreements include commitments to notify the other party immediately about any accidental missile launch and to destroy the missile, advance notification of missile launches, and the creation of Nuclear Risk Reduction Centers in Moscow and Washington.

The positive effects of these measures have to some extent been counteracted by developments in nuclear weapons systems and military strategy. As the risk of intentional Super-Power war has diminished, the risk of accidental nuclear war is considered to be unacceptably high today and further protective measures are needed. The essential measures must be based on an evaluation of the command and control system.

Increasing Risks

There are some developments which are viewed as likely to increase the risk of accidental nuclear war:

- Internal turmoil in nuclear weapon States
- Conflicts emphasising the perceived need for weapons of last resort, such as chemical or nuclear weapons
- Clandestine nuclear proliferation in some countries, mainly in crisis-exposed regions
- The possibility of nuclear terrorism
- The development of high-precision, short-time-of-flight or stealth weapons that make rapid response necessary
- The development of anti-satellite and other space weapons further emphasising the need to pre-plan short-time responses.

There have been fundamental changes in Europe in the course of the last few years. Improved relations between the United States and the Soviet Union, the democratisation and liberation process in Eastern Europe, the unification of Germany, the development of the Common Market and, finally, the search within the CSCE for a new security structure for Europe are all very positive elements. On the other hand, old and earlier suppressed conflicts in Europe are emerging once again and may create problems in the future.

A new aspect has been added by the unrest, on occasion armed and violent, within the Soviet Union, which possesses thousands of widely deployed nuclear weapons. Concern has been expressed about the possibility of nuclear warheads being stolen and used to achieve local political or private goals, or even sold to another country. However, according to reports from the Soviet Union, nuclear weapons have been removed from conflict areas.

The recent war in the Persian Gulf exemplifies a new type of confrontation, in which the development of ballistic missiles has been particularly significant and the use of nuclear or chemical weapons seemed a possibility.

Developments within countries assumed to be engaged in covertly acquiring nuclear weapons are apparently going on without much restraint. Several of the countries in question now have ballistic missiles. As some of these countries lack the political stability and technological capacity to control nuclear weaponry effectively, the risk of leakages to terrorist groups or of unauthorised use during political turmoil will also increase. Such use may be misinterpreted by some established nuclear weapon States and lead to further escalation.

Current and potential conflicts within and between developing countries and the acquisition of modern weapons by these countries underline the need to prevent accidental war.

Another factor to be taken into account is technological development within the established nuclear powers. There is increasing sophistication in terms of improved accuracy, stealth technique and reduced flight times. These developments, combined with changes in strategic doctrine, greatly increase the difficulty of further developing an integrated command-and-control system to ensure firm political control of nuclear weapons. Shorter decision times exacerbate the consequences of computer failure, programme errors and human dysfunction. The vulnerability of command-and-control systems creates dangerous incentives to use force quickly, even pre-emptively, before the systems collapse.

The development of anti-satellite and space weapons further emphasises the need to plan short-time responses. Hence these weapons are highly destabilising.

The widespread presence of non-strategic naval nuclear weapons is a matter of grave concern, since their early use in a conflict could be encouraged by the theoretical possibility that they could be used in a military encounter at sea without causing direct damage to civilian life or property. To make matters worse, these weapons are not protected by PALs adequate to preclude their use without authorisation by the central political authority. In view of the increasing risks referred to above, measures designed to prevent accidental nuclear war have become very urgent.

Structure of the Action Programme

The action programme covers a number of ways in which the risks of accidental nuclear war could be reduced:

- Reduction of mutual mistrust, misunderstanding and fear, and the building of confidence through increased openness about nuclear forces and restraints on their operation
- Improvement of crisis stability through sufficient survivability of weapons and command-and-control systems and through reduced reliance on short-time reactions
- Improvement of political control of weapons

- Prevention of the proliferation of nuclear weapons
- Abolition of destabilising systems
- Improvement of crisis management capability.

Special emphasis should be put on the interrelationship between the further technological development of the arsenals of established nuclear powers (vertical proliferation) and the spread of nuclear weapons to further countries (horizontal proliferation). A comprehensive nuclear-test ban, combined with major reductions of the nuclear arsenals, could reduce the prestige of owning nuclear weapons and thus contribute to non-proliferation.

Verification of compliance with agreed arms control measures is quite essential. This problem will be easier to solve with the new openness shown in recent arms control agreements, such as the Treaty between the United States and the Soviet Union on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (the INF Treaty) and the Treaty on Conventional Armed Forces in Europe.

The action programme for the prevention of accidental nuclear war consists of a number of measures, which are assigned to four different though interrelated packages. Attempts to get the specified measures accepted politically and implemented should be carried out simultaneously in each of the four packages, and as soon as possible.

Within the first two packages the measures are selected as far as possible with a view to their being:

- Individually effective in reducing risks
- Mutually reinforcing
- Politically feasible
- Sufficiently verifiable to prevent violations.

The first package is a programme for reducing risks connected with existing nuclear arsenals. It is made up of steps that can be taken at an early date. The unilateral steps and bilateral confidence-building measures proposed here are intended to make a substantial contribution to reducing the risk of accidental war. The limited nature of the proposals should make them relatively easy to negotiate, agree upon and implement. The proposals will not require major changes in existing nuclear arsenals or in the concept of nuclear deterrence. This package contains 15 proposals, and some of them are as follows:

- The legislatures of all nuclear weapon States should demand and receive authoritative reports from a commission of military and independent experts, reviewing in detail the adequacy of existing safeguards of all nuclear weapons in their arsenals.

- All nuclear weapon States should be party to agreements calling for immediate notification of accidental launches or other unexplained incidents that could create the risk of a nuclear war. Given the short time involved in warning, missile flight and decision-making, it is important to decide in advance how to deal with any given situation.
- In order to increase political control of nuclear weapons, at least the United States has installed PALs, or their functional equivalents, on army and air-force nuclear weapons. These devices would make it impossible for anyone to detonate the warhead without a specific electronic or mechanical input from the highest political authority. PALs should be installed on all nuclear weapons; no exception should be made for naval nuclear weapons.
- Outbreaks of regional conflict in the third world, involving regional powers equipped with large arsenals of conventional arms plus chemical and possibly nuclear munitions, are a major emerging threat to world security during the 1990s and beyond. Confidence-building measures are needed to reduce mutual apprehension regarding the military intentions and capabilities of competing regional powers, and to reduce the risk that relatively minor incidents will ignite a major armed confrontation.

The second package should be seen in connection with major nuclear arms reductions (START II and others). The measures are intended to ensure that during the arms reduction process the risk of accidental war is further reduced and kept to a minimum.

In this package, there are nine proposals. The most imperative step seems to be to abolish the most destabilising strategies, systems and forces.

- Any strategy of launch-on-warning should be renounced and retaliation should be delayed until the source and size of the attack have been evaluated. Consequently, vulnerable and destabilising nuclear weapons such as fixed-site, land-based, ballistic missiles and more accurate short-flight-time systems should be the first to be abolished. For the same reason, the command-and-control systems should be designed to function in a nuclear environment (protection against electro-magnetic pulse (EMP), ground mobile or airborne command centres and communication nodes). There should be an agreement not to deploy anti-satellite weapons.

- In order to reduce the prestige of nuclear weapons and to convince the threshold States of their uselessness, the established nuclear weapon States should make significant cut-backs in their arsenals, and stop all testing of nuclear warheads. This would be seen as a very positive and necessary response to the criticism expressed at the 1990 Review Conferences of the Treaty on the Non-Proliferation of Nuclear Weapons. Otherwise it might be difficult to renew the Treaty in 1995.

The third package is a programme dealing with a new negotiating forum and a new legal framework (a treaty) for handling the prevention of accidental nuclear war. As a nuclear exchange would affect people everywhere, a new body with broad global representation needs to be set up on the basis of the principle of common security:

- At least initially, we consider it necessary to have negotiations concerning the prevention of accidental war separate from ongoing structural arms control negotiations so that the negotiations on the prevention of accidental war may not be delayed by them. The Conference on Disarmament in Geneva should set up a new sub-committee with a view to achieving, as a matter of high priority, agreement on a programme for the prevention of accidental nuclear war. This Action Programme could be used as a model.
- A new treaty on the prevention of accidental nuclear war might be negotiated by the new sub-committee. That body could, for example, agree on confidence-building measures similar or parallel to those adopted by the Conference on Security and Co-operation in Europe.

The fourth package consists of a programme intended to create and sustain public awareness and concern about the problem of accidental nuclear war. This will provide the basis for public pressure on civil and military decision-makers and advisers within Governments to do everything possible to reduce the risk of accidental war.

- An information campaign on the dangers of accidental nuclear war is essential. It could be seen as a supplement to the United Nations comprehensive study on nuclear weapons, and to efforts by the International Physicians for the Prevention of Nuclear War to make people aware of the disastrous consequences of a nuclear war.

- Education on these matters should be an integral part of university-level curricula, and such initiatives as the projects by the Talloires group and the International Association of University Presidents should be supported.

Launching the Programme

A basic question for the Swedish group is how the Action Programme for the Prevention of Accidental Nuclear War should be launched and supported in order to influence decision-makers in the nuclear weapon countries.

As a first step, Swedish parliamentarians have submitted a proposal in the Swedish Parliament asking the Government to use the Action Programme for the Prevention of Accidental Nuclear War to develop initiatives in the United Nations for discussion in the Disarmament Commission and the General Assembly, and in other forums as well.

The General Assembly has several times noted with regret that, despite the fact that the Conference on Disarmament has discussed the question of prevention of nuclear war for several years, it has so far been unable to establish a subsidiary body to consider appropriate and practical measures for preventing it. As stated above, one goal is that the Conference on Disarmament in Geneva should, as a matter of high priority, establish a sub-committee to undertake multilateral negotiations to achieve agreement on a programme for the prevention of accidental nuclear war. Some further initiatives by the United Nations General Assembly seem to be necessary.

The above-mentioned initiatives could, if considered necessary, be supported by a resolution of the General Assembly requesting the Secretary-General to appoint a group of experts to prepare a comprehensive report on the risks of accidental nuclear war.

At the same time, the Action Programme should also be brought to the attention of nuclear weapon States engaged in bilateral negotiations, for example in connection with START II and the forthcoming negotiations on short-range nuclear weapons in Europe.

Parliamentarians for Global Action could be encouraged to bring the dangers of accidental nuclear war to the attention of parliamentarians throughout the world.

Lawyers and their associations need to be encouraged to work on the further development of an international legal regime relating to the prevention of accidental nuclear war. We hope that the International Association of Lawyers against Nuclear Arms, in particular, will act on the Swedish Initiative and that the programme will be further discussed at forthcoming scientific and other nongovernmental congresses. Current research has for the most part been devoted to risks related to East-West relations. More emphasis should in future be put on the prevention of nuclear war in other regional contexts. It is gratifying to note that an international conference on this theme is to be organised in Tallinn, Estonia, in October or November 1991 under the auspices of the Estonian Academy of Sciences.

Experts, guests and youth participants at the 1990 Stockholm conference have undertaken to submit articles to influential journals and other media in their home countries, advocating measures to prevent accidental nuclear war.

It is hoped that the Action Programme will be made available as widely as possible to citizen groups and popular social movements concerned about world peace, and that young people will be invited to participate in future initiatives of this kind alongside the "experts", to work towards increasing the safety of nuclear weapons.

PREVENTING ACCIDENTAL NUCLEAR WAR: RISKS AND REMEDIES IN A POST-COLD-WAR ERA

For over forty years, the world has been haunted by the spectre of a global nuclear war arising from a deliberate or even an inadvertent escalation of the strategic confrontation between the United States and the Soviet Union. Most dramatically in 1962, but also in 1968 and 1973, nuclear weapons systems were readied for war in response to a Super-Power crisis. From 1982 to 1987, both sides deployed nuclear forces in such a manner that they could destroy each other's headquarters and command systems in less than eight minutes. At any moment during these periods of nuclear brinkmanship a failure in crisis management on either side might have resulted in the destruction of planetary civilisation.

Since 1987, the dramatic improvement in United States-Soviet relations has markedly reduced the risk of both deliberate and inadvertent escalation, and the leaders of the two nations have declared their intention to eliminate this danger altogether. Nevertheless, even if nuclear war as a conscious instrument of Soviet or American policy is no longer conceivable, there are a number of good reasons for believing that a Super-Power nuclear war could still begin by accident. The increasing size of nuclear weapons arsenals possessed by France, the United Kingdom, China and a growing number of other nations has extended the risk of both deliberate and inadvertent nuclear war to many regional conflicts, while at the same time it has complicated the task of preventing an accidental war between the Super-Powers.

An accidental nuclear war even at the regional level would dwarf the apocalyptic impact of the recent Gulf war on the civilian populations in the affected areas. In the case of the Super-Powers, an accidental nuclear weapon launch involving even a single local command could result in as many as 300 to 500 nuclear explosions each 10 to 30 times as powerful as the bomb that destroyed Hiroshima, representing a catastrophe unparalleled in human history. In today's radically altered international climate, there is no longer any need to tolerate such a horrifying possibility. A few relatively simple and inexpensive steps, taken unilaterally or by multilateral agreement among nuclear weapon States, could sharply reduce the risk of accidental nuclear war without any serious impact on their national security or the military balance.

The Post-1987 Risk of Accidental Nuclear War

The intense United States-Soviet arms race and strategic confrontation of the early 1980s alarmed many strategic analysts who felt that certain provocative modifications to the nuclear deployments and doctrines on both sides immediately before and during that period had created a significant risk that a major political crisis could trigger a nuclear war by accident or inadvertence. Improving Super-Power relations in recent years have gone a considerable distance to reducing at least two of these concerns.

At the level of strategic command, control, communications and intelligence (C^3I), a growing consensus had developed during the 1980s that the deployment of "fast attack" strategic nuclear systems within range of key command centres would reduce to almost zero the time available to decision-makers to distinguish between a real attack and a false alarm. Capable of destroying hardened sites and disrupting communications with a nuclear-generated "electromagnetic pulse" in less than eight minutes after launch, these deployments virtually forced strategic planners on both sides to adopt a *de facto* policy of "launch on warning" in the event of a serious crisis. Analysts estimated that under some conditions, the chance that a false alarm could provoke a nuclear launch could be as high as 50 per cent.

The 1987 Treaty between the United States and the Soviet Union on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty) represented a major step towards the elimination of this strategic nuclear hair-trigger. It committed the two powers to the complete destruction of the most provocative fast-attack systems, particularly the American Pershing II ballistic missile and all ground-launched cruise missiles (GLCMs) on the United States side, and the SS-20 (RSD-10) on the Soviet side. Informally, the Soviets responded to the signing of the INF Treaty by redeploying their ballistic missile submarines out of range of United States command centres, a development that was greeted, in the words of one senior United States Air Force officer, with "immense relief."

The end of the confrontation between members of the North Atlantic Treaty Organisation (NATO) and members of the Warsaw Treaty Organisation (WTO) in central Europe sharply reduced the risk of nuclear accident as the result of tactical nuclear systems as well. From 1967 until 1990, the military operating doctrine of NATO provided for the early release of tactical nuclear weapons to theatre commanders in the event of a conventional attack by WTO. Most analysts noted that the conflicting requirements of allied consultation, dispersal and concealment, physical security, and command structure integration meant that the actual process of tactical release in the event of a European war would be chaotic at best, and at worst would create a considerable risk of the accidental or unauthorised use of nuclear weapons systems. Faced with this threat, Soviet military commanders moved to integrate their nuclear systems more closely with their forces in Europe, especially after East-West tensions began to increase in the early 1980s. Many feared that these developments could lead to an uncontrollable spiral of nuclear escalation in the event of an armed conflict in Europe, especially given the inevitable compromises with safety and security involved in designing and deploying small, mobile nuclear systems. Fortunately, these frightening hypotheses were never put to the test as improving Super-Power relations, the withdrawal of most Soviet forces from Eastern Europe, and the recently signed Treaty on Conventional Armed Forces in Europe have virtually eliminated the risk of a United States-Soviet nuclear confrontation in Europe.

But, the positive impact of improving Super-Power relations has not resulted in the total elimination of the threat of accidental nuclear war. A number of key risk factors have been affected little or not at all by the improving climate and, paradoxically, in some ways the chance of a war by accident may actually have increased since 1987. Seven factors may be identified that contribute to the ongoing threat of accidental nuclear war:

1. The overall level of nuclear readiness that continues to be maintained by the nuclear forces of both the United States and the Soviet Union;
2. Ongoing concerns about human reliability, especially given the very large and still expanding number of nuclear weapon States and systems;
3. The ever-expanding automation of nuclear systems, and in particular the introduction of so-called artificial intelligence systems as part of the management of nuclear operations;
4. The large number of nuclear weapons—especially tactical ones—with less sophisticated, earlier-generation safety and security features;
5. The special risks posed by the growing number of naval strategic nuclear platforms and weapons;
6. Within the category of naval systems, the particularly acute dangers posed by submarine operations and submarine-launched nuclear weapons;
7. The almost incalculable dangers posed by the threat of civil conflict in nuclear weapon States.

Nuclear Readiness

To begin with, a significant risk is posed by the high level of strategic nuclear readiness maintained by both the United States and the Soviet Union. The latter maintains between 50 and 80 per cent of its intercontinental ballistic missiles (ICBMs) in launch-ready status, and 15 per cent of its ballistic-missile-firing submarines at sea. American forces are typically at an even higher level of alert, with 90 per cent of their ICBMs launch-ready, half of their missile submarines at sea, and at least a quarter of their bombers on ground alert. Of course a dominant objective of both sides is to prevent an accidental or unauthorised launch, and both have put in place scrupulous safeguards and sophisticated technology to achieve this end. But, even their long record of success is not an argument for complacency; no large and complex system can be made totally failureproof.

In fact, several times every day the multiply redundant sensor systems that are designed to warn of an enemy attack—radar, optical and infrared—produce anomalous signals that might be indications of an attack. Although most are quickly discounted, on an average of once a year or so such a false alarm is misinterpreted or misprocessed, and ends up triggering a nuclear alert on the American side. These nuclear alerts increase still further the proportion of nuclear forces placed in a high state of readiness and, more ominously, begin the process of readying United States strategic forces for use. Bombers are scrambled, silos are readied, warning messages are sent to submarines, and the National Command Authority—the Joint Chiefs of Staff, the Secretary of Defense, and the President—are notified.

Thus far, this self-triggering of the United States nuclear alerting system has always been partial, and halted well before an actual launch. But, in the midst of a crisis— even one not directly involving the USSR—the default option for an American leadership facing an apparent strategic threat might be to continue rather than discontinue the activation of its own strategic systems. Warnings of these moves received by their own sensors might well lead the Soviets to initiate their own alert, beginning a lethal feedback loop of mutual escalation and heightened tensions.

Clearly there can be no possible justification for the dangers posed by such a tightly wound system save the imminence of strategic confrontation. Given the fact that such an event is now extraordinarily unlikely and perhaps impossible, simple prudence would suggest large bilateral reductions in the readiness levels of nuclear forces.

Human Reliability

The tight centralised control maintained over nuclear weapons in peacetime has led some to claim that human reliability does not, in and of itself, create a risk of an accidental war. Unfortunately there are several flaws in the argument. The first is that large numbers of weapons require even larger numbers of personnel to manage their operation, security and transport, and despite careful screening these individuals may not always be reliable. Every year between 2,000 and 3,000 United States armed forces personnel having access to nuclear weapons or their components are removed from duty for chronic alcohol and drug abuse, psychological problems requiring hospitalisation, or felonious or insubordinate conduct involving violence. “Nuclear duty” seems to create a dangerous combination of boredom and stress, and its effects are not always possible to detect in advance. One missile-control technician in a United States ballistic-missile submarine committed a multiple homicide while on leave, and there have been several reported instances of submarine captains suffering from near total psychological collapse while in command of their nuclear arsenal. We have no comparable data for the Soviet Union, but rumours persist of poor morale, alcoholism and drug abuse. Clearly the record affords us no reason for complacency with regard to the human reliability problem.

In a crisis, the ineluctable problem of human fallibility will be magnified by the additional stress. Every level of command right up to the top political leadership will be acutely aware that their lives and those of their families hang in the balance during a strategic confrontation. Psychological studies have shown that the fatigue of a lengthy crisis will attenuate the ability to manage complex modern military systems, producing a general disorganisation of performance and, ominously, a greater willingness to take risks and ignore dangers.

Acute information overload combines with confusing and uncertain data to create additional anxiety, which then induces still more mistakes and judgemental errors. Perhaps, most critical of all, the time pressures produced by a nuclear alert—sometimes requiring a decision involving national or even planetary survival to be made within a few minutes—act to impair information processing. People affected simultaneously by danger and time pressure focus on "quick fixes" and stereotyped reactions, are less likely to distinguish relevant from irrelevant data, will "tune out" novel information, and will cease or reduce attempts to communicate with the other side.

These findings shape the lethal paradox of crises in the nuclear age: they make superhuman demands on perceptual acuity and decision-making skills, and those very demands lead to a degrading of both perception and judgement. The high incidence of human reliability problems even in peacetime strongly suggests that there are many individuals in positions of leadership or with access to nuclear weapons whose unresolved inner conflicts and/or unhappy interpersonal relationships make them particularly vulnerable. We have documented evidence of stress-induced breakdown during nuclear crises at the highest levels of command in several nations, and we may surmise that the same phenomenon has and may predictably be expected to occur down the ranks as well. Thus, despite painstaking precautions, there can be no question that an accidental nuclear war could under some circumstances result from mistakes, misjudgements, misinterpretations, oversights, faulty analysis or reasoning, failure to search for and act upon new information, and poor communication

Automated Systems

One response to the risk of human error in nuclear operations has been their increasing automation. Especially in the United States armed forces, but increasingly among the military of other nations as well, planners now believe that "automation, robotics, and associated use of computers in artificial intelligence modes... will substitute for people in certain tasks; they will allow people to perform tasks better than they perform them now; and they will enable performance of tasks they cannot now perform."

In attempting to use such systems to overcome human limitations, systems designers have created a whole new class of problems, and in so doing will probably increase rather than decrease the risk of accidental war. For computers to replace people in decision-making tasks they must be programmed to select and classify the buzzing welter of complex information needed to make real-life choices. Attempts to automate this human-pattern-recognition capability have proved to be one of the most fruitless tasks of software designers, and the "fog" of war and crisis exacerbates the problem. This limitation on the input side is matched by a corresponding limit on the output decision "menu". Such systems typically pre-package decision choices (fire system A/B/C/don't fire/continue tracking). As long as the situation corresponds to a pre-specified choice, all is well. But, sometimes the very essence of quality decision-making is the search for novel options. In curtailing this search, automated decision-aids reinforce rather than counteract the stress-induced premature decisional closure that may result in missing an opportunity to avoid war.

Moreover, the hierarchical and often counter-intuitive architecture of many decision-aids may add to stress rather than relieve it. An everyday example of the problem occurs when we attempt to use bank machines under stress and in a hurry, losing our way in the menu and futilely striking the wrong buttons in mounting frustration. Nearly identical situations have actually occurred with automated weapons systems both in training and in combat. The destruction of an Iranian civilian airliner by the USS *Vincennes* in the Persian Gulf was the direct result of the confusion created in the minds of some officers by the complex computer-generated displays of its AEGIS automated anti-aircraft system, demonstrating in a most tragic way that automation may induce more accidents than it prevents.

Finally, as these systems become larger and more complex it may become virtually impossible to debug the programme code. Automated combat systems controlling both conventional and nuclear weapons are at the extreme end of the scale; the SUBACS submarine battle system, for example, has more than 4.5 million lines of code. Interactions between the various parts of such large programmes are so complex that they can produce unexpected catastrophic failures, and attempting to fix them may introduce more errors.

Computer professionals never cease to warn us of the problems and limitations of automated systems, speaking of "the enormously exaggerated attributions even a well-educated audience is capable of making... to a technology it does not understand... there is potential for great tragedy if this credulous streak should some day combine with a mood of compulsive belligerence." In short, even in the eyes of their designers, automated systems are more likely to provoke than to prevent an accidental war.

Security of Tactical and Mobile Nuclear Weapons

No matter what the balance between computer and human control, the sheer size of national nuclear establishments may put them at risk. The large number of smaller, tactical weapons widely dispersed among the forces of all nuclear weapon States raises security and safety concerns, especially with regard to their storage and transportation. Although no nuclear weapon has ever been detonated accidentally, there have been numerous cases in which weapons or their components have been damaged or destroyed by fire, explosion or air crash. Early in 1950, an American bomber carrying several thermonuclear weapons crashed in the ocean off Vancouver Island. Later that year, the chemical explosive trigger of a bomb blew up after being jettisoned over eastern Quebec. In 1956, a bomber carrying nuclear warheads crashed in Morocco, and in 1968 two more were lost in a crash in Greenland. Other nuclear weapon accidents include a B-52 crash in Tennessee, two bombs dropped into the ocean off the Mediterranean coast of Spain, and still another weapon lost from the deck of a United States aircraft carrier off the coast of Viet Nam.

Given the fact that many of the United States stockpile of 24,000 nuclear warheads are transported almost daily, future accidents cannot be ruled out. Compounding the problem is the fact that many of the tactical weapons in particular are earlier, less sophisticated models, and are beginning to show the effects of age. Recently, between 300 and 400 W79 nuclear artillery shells had to be transported back to the United States from Europe when it was discovered that aging explosives combined with a design defect might have caused them to explode during handling.

The rise in international terrorism has raised additional concerns about the widely dispersed storage of nuclear weapons. A recent report of the United States Department of Energy suggested that the precautions against a terrorist attack on nuclear storage facilities outside the United States were inadequate. Moreover, many of the weapons at these sites were older models lacking the sophisticated internal security features of later types. Persistent reports of nuclear safety problems have now led to an ongoing Congressional investigation. Although there is no public information available concerning the safety and security situation for other nuclear weapon States, it is likely that much of their stockpiles consist of weapons that resemble the older, less sophisticated American systems rather than the more advanced models.

Of course, a nuclear accident or terrorist incident in peacetime would be extremely unlikely to result in a war-threatening inter-State conflict. But, during the tension and confusion of a crisis, such an event might be misinterpreted by either or both sides as a deliberate hostile act. Expert analyses suggest existing communication systems designed to prevent such misunderstandings—including the now-famous "Hot Line"—could prove inadequate in many circumstances.

Naval Nuclear Weapons

The risk of an accidental launch is particularly acute with respect to nuclear weapons carried by forces at sea, which uniquely lack critical security and safety features built into virtually all other nuclear weapon systems. The most important of these are the so-called permissive action links (PALs), electromechanical devices which prevent the detonation and sometimes even the arming of a nuclear warhead without the insertion of a special unbreakable code that must come directly from the National Command Authority. The more recent types are built into the weapon in such a way as to make them impossible to bypass, and any attempt to do so would result in the permanent disabling of the weapon. Secondary devices known as coded switch systems are sometimes built into weapons delivery systems to prevent them from being fired or activated. All American and Soviet bombers that carry nuclear payloads, and all land-based strategic and tactical missiles, are equipped with some version of these devices.

Not so nuclear weapons carried by naval forces. The United States Navy—and, apparently, its Soviet counterpart as well—has always successfully argued that difficulties in communicating long coded messages to naval units precluded the installation of PALs on seaborne nuclear weapons. Reinforced in this policy by the long-standing naval tradition of "not taking rudder orders from the beach", procedural safeguards are substituted for physical ones. Multiple authentication of orders by the captain and a number of senior officers via elaborate systems of safes, keys and codes are used to guard against unauthorised launch. Nevertheless, there is nothing to physically prevent the officers and crew of nuclear-equipped naval units from launching their weapons without orders, a fact recently dramatised in the *movie Hunt for Red October.* It is disturbing to note that during Congressional testimony in 1983, Admiral W. Holland answered a question about the issue of political control over naval nuclear weapons by remarking, "We have not yet come to grips with that part of the problem."

In fact, the size, potency and special strategic importance of the submarine-launched ballistic missile force make it the focus of uniquely rigorous personnel selection policies and other procedural precautions designed to thwart unauthorised actions. Its strategic role as a reserve force not designed for action in the opening stages of a conflict, combined with the operational imperative to avoid all contact with enemy units, has helped to make these measures effective.

There is more reason to worry about other seaborne nuclear weapons. Tactical nuclear weapons of various types are carried aboard a variety of Soviet and American naval vessels, including surface battle groups and attack submarines that would be among the first units to be engaged in a conflict.

An even greater potential threat is long-range nuclear cruise missiles, whose conventional counterparts proved so accurate and effective in the recent Gulf war. Both the United States and the Soviet Union plan to deploy hundreds of even more advanced nuclear cruise missiles aboard cruisers and attack submarines. A verifiable limit on their numbers has not yet been agreed to, nor will it likely be part of the package defined in the strategic arms reduction (START) treaty. The improved *Los Angeles* class attack submarines now entering service are all equipped with a vertical launch pod carrying up to 12 TLAM-N nuclear cruise missiles, and more can be fired from torpedo tubes. The new models of the *Ticonderoga* class AEGIS cruisers can fire the TLAM-N, as can the *Iowa* class battleships. On the Soviet side, the *Sierra, Akula* and *Oscar* class nuclear attack submarines are all equipped to launch the new SS-N-21 land attack cruise missile. The effect will be to increase by a factor of three or four the number of naval units with strategic nuclear capability, and to distribute long-range nuclear weapons more widely among front-line forces, all of which seriously aggravates the risk that an accidental nuclear war might begin at sea.

Special Risks Posed by Nuclear-capable Submarines

The risk posed by the growing number of strategic nuclear weapons with lower levels of safeguards against misuse is particularly acute with regard to attack submarines. This is so because of the strategic missions assigned to submarine forces, their uniquely uncertain and dangerous tactical environment, and the near-impossibility of maintaining communications with, and control over, submerged submarines.

Because modern submarines are so difficult to detect and locate, they can perform very intrusive and aggressive missions without being noticed. Were these same missions to be undertaken by more visible forces, they might provoke diplomatic conflict, retaliation, or perhaps even an armed clash. They can be used to trail and monitor an opponent's surface and subsurface units, or for clandestine intelligence-gathering in his home waters. There is considerable evidence that both American and Soviet submarines have been used in this way, and that this has created a "combat culture" among submariners on both sides, leading them to behave routinely as though they were virtually at war. The resulting aggressive patrolling and manoeuvring have led to some terrifyingly close calls and at least one catastrophe.

The new quieter Soviet subs can now penetrate the anti-submarine warfare (ASW) screens of American carrier battle groups; one recently surfaced unexpectedly only a few hundred metres behind one carrier. American submarines operate even more aggressively; in 1986 the USS *La Jolla* violated Soviet territorial waters several times, and nearly collided with Soviet submarines while manoeuvring in a style "that would rival John Wayne". The same year another *Los Angeles* class submarine actually collided with the Soviet *Delta IV* submarine it was trailing. In 1970, a similar collision between the USS *Tautog* and a Soviet *Echo-II* class missile submarine was catastrophic; the Soviet boat sank with all hands.

If routine patrols and exercises can result in fatal confrontation, one can only imagine the perils in the terrifying circumstances of a nuclear alert. This is particularly true in the undersea environment, where the perils are greater and where acquiring reliable tactical information is almost impossible. Submarine combat means almost certain death for the loser, and under water the hunters are always the hunted as well, since the very tactics used to detect and destroy enemies may cause them in turn to be detected and destroyed in that literally opaque battle environment. A submarine must rely almost entirely on the ambiguous information provided by passive sonar, with the result that "no environment so severely imposes the 'fog of war' as the undersea battleground", and each side imagines an attacker "to be anywhere or everywhere." On one occasion, a NATO submarine commander almost attacked a fishing fleet when acoustic distortion led him to believe it was a Soviet submarine, and there are many instances in which the use of defensive measures such as acoustic decoys by one side have been misinterpreted as possible torpedo attacks.

All of this is further aggravated by the difficulties in communicating with submarines. Without risking his boat by trailing a visible and noisy antenna, a submarine commander can only receive slow low-frequency messages, and cannot transmit. He will be largely ignorant of unfolding events, and headquarters may be ignorant of his fate. Once a crisis is well under way, command authority will lose virtually all control over the undersea battle. In the nuclear alert accompanying the 1973 Yom Kippur war, United States and Soviet submarines remained engaged for weeks after the crisis formally ended. More recently during the Falklands war, the HMS *Conqueror* sank the Argentine cruiser *Belgrano* without an explicit order from political authority as the result of a communications confusion, and the result was an irreversible escalation of the war.

Thus, there can be little doubt that the growing proliferation of strategic-capable nuclear cruise missiles aboard attack submarines that often operate virtually outside the C^3 I loop constitutes perhaps the most acute risk of accidental nuclear war. The danger will be multiplied by the simultaneous *horizontal* proliferation both of nuclear weapons and of submarines. Even conventional submarines can provide an effective long-range delivery system for nuclear weapons, and they are much more abundant among potential nuclear weapon States than long-range ballistic missiles. Moreover, their stealth might make it difficult or impossible to identify the perpetrator of an attack, especially if the culprit submarine is a model operated by several nations. In the tense circumstances of a crisis, a nuclear or even a conventional submarine attack by a third party might result in a fatal escalation on the mistaken belief that the opponent had launched an attack.

A Nuclear Civil War?

There is, finally, a major accidental war risk factor—a breakdown of order within a nuclear weapon State. This is potentially the most serious risk while being at the same time the most difficult to evaluate.

Even the most pessimistic and worst-case scenarios outlined above have taken for granted thoroughgoing efforts to maintain tightly centralised national control over nuclear stockpiles and the enforcement of strict obedience up and down the nuclear hierarchy. Independent of any political disputes or internal dissension, the leadership groups in nuclear weapon States are united in their determination that nuclear C^3 I be kept above the fray, and so far these efforts have been successful.

If internal political tensions were to escalate into armed conflict, or even an all-out civil war, this heretofore secure assumption could erode dramatically. The opportunities for rebel military units or regional armed uprisings to seize nuclear weapons and threaten their use are of course powerfully constrained by the existence of PALs. But, if the loyalty of the nuclear command structure itself should fracture, this restraint might be removed. For example, if a split developed within the national command authority itself, or even at a high level within the armed forces, nuclear security could be quickly compromised. This is not idle speculation; during the political turmoil in China in 1989, many analysts worried privately that nuclear-armed units might actually fight each other, and for a period of several weeks were unable to assure themselves that a divided political leadership would be able to maintain centralised control of their weapons.

In this context the lack of PALs on most naval nuclear weapons assumes particular importance. Even if a civil war left the nuclear command structure intact, rebel naval units might be able to use their weapons to influence the outcome of a conflict. If there were a struggle for control within these units, the risk of an inadvertent or unauthorised launch would be enormously increased.

The risk is not only that a handful of weapons could fall into rebel hands or actually be used in the struggle, bad enough though this would be: perhaps a greater danger is the *international* crisis that would be precipitated by a perceived breakdown in nuclear control; in all likelihood, other nuclear weapon States would respond by alerting *their* nuclear forces as a precaution, which move itself reduces the "negative control" of national command authority. The result would all too likely be a self-feeding spiral of increasing tensions, uncertainty and loss of control which would increase enormously the risk of an accidental launch.

Some Policy Recommendations

Policy recommendations to reduce the risk of accidental nuclear war follow directly from the specific dangers enumerated above.

To begin with, there can no longer be any justification for the high levels of readiness of United States and Soviet nuclear forces. Given the fact that a deliberate nuclear attack or even a conventional war between these two powers can now be virtually ruled out, only those nuclear forces sufficient for minimal deterrence need be maintained at high readiness. The number required for this purpose has been the subject of endless debate among strategists, but certainly a maximum of 2,000 strategic warheads for each side mounted on the least vulnerable delivery systems (ballistic missile submarines and mobile ICBMs) would be sufficient. This represents only 20 to 30 per cent of the forces currently at high-readiness levels.

Such a reduction need not await a formal arms control treaty. Remotely verifiable "demobilisation"—consisting of such steps as reduced rates of bomber missions and submarine patrols, or the physical separation of some warheads from their delivery systems—could begin with informal bilateral agreement or even unilateral initiative, with their final destruction awaiting a treaty. "Fast tracking" nuclear demobilisation in this way can provide a quick and secure route to a reduction of the accidental war risk.

Reducing the numbers of active systems by itself reduces the magnitude of the human reliability problem, but additional measures can and should be taken. Recent advances in cognitive psychology allow the objective measurement of an individual's ability to cope with complex and stressful tasks, and how well that ability holds up under external stress. The application of such testing procedures to personnel with nuclear security and command responsibilities—including the political leadership— should be explored.

At the same time, great caution should be taken in introducing automated systems into the nuclear command loop, especially artificial intelligence systems. Given the elimination, with the INF Treaty, of short flight time systems, the abandonment of pre-emptive strategies, and the virtual demise of the American Strategic Defense Initiative, there is no longer any plausible rationale for such systems.

Another step that would greatly reduce the risk of accidental war would be the elimination of most *tactical* nuclear weapons. These have in any case lost most of their *raison d'etre* with the end of United States-Soviet confrontation in Europe, and it is hard to imagine their use in any foreseeable regional conflict. The United States Navy is already in the process of decommissioning most of its tactical nuclear weapons, and there would seem no good reason why the other armed forces—and those of other nuclear weapon States—should not follow suit. As with a reduction in strategic nuclear readiness, this would not have to wait for a completed arms control treaty.

Another important measure would be the placing of PALs on all naval nuclear weapons. The small tactical penalty to be paid as a result of the inevitable communications delays surely no longer outweighs the risks of operating large numbers of weapons without these critical physical safeguards.

Even if PALs are installed on naval nuclear weapons, there would seem to be no compelling rationale for multiplying the number of strategic-capable naval nuclear weapons and platforms. Cruise missiles—especially on attack submarines—pose serious problems of arms control verifiability, increase the risk of accidental launch, and have no discernible advantage over ballistic missiles as a deterrent force. Some analysts have already noted that a reduction in the number of nuclear-powered attack submarines, along with limits on the sale or transfer of submarines to other States, may in any case be necessary to protect the smaller ballistic missile submarine force remaining after the cuts mandated by the forthcoming START treaty.

Finally, there is clearly no simple or transparent solution for dealing with the potential nightmare of civil disorder in nuclear weapon States. It is therefore this author's urgent recommendation that an international panel of technical experts be convened to study the problem and make specific recommendations concerning unilateral and multilateral measures that might be taken to prevent an accidental war from beginning in this way.

One avenue that might be explored is the development of PALs whose status could be queried by a remote signal. This would enable the leaders of other nuclear powers—and perhaps an international agency or authority—to determine whether the nuclear weapons in the affected State were securely locked. The ability to obtain this information could act as an important confidence-building measure to help prevent a "nuclear involved" civil conflict from manufacturing an international crisis. It would also serve as a powerful deterrent against those who might be tempted to obtain or use these weapons illicitly.

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TOWARDS GLOBAL SECURITY FROM NUCLEAR WEAPONS AND NUCLEAR WAR

Nuclear weapons represent a historically new form of weaponry with unparalleled destructive potential. A single large nuclear weapon could release explosive power comparable to all the energy released from the conventional weapons used in all past wars.

Only two nuclear weapons have ever been used in a war. Today, there are about 50,000 nuclear warheads in the possession of the nuclear weapon States. The quantitative growth of the nuclear -weapon arsenals has, however, been stopped. The number of nuclear warheads is now declining.

In recent years, there has been a marked improvement in the overall international political climate and in relations between a number of States in various regions of the world. The most far-reaching changes have taken place in Europe, a continent where the two major nuclear powers and their military alliances have confronted each other for decades. New political patterns are emerging there, whereby long-standing differences are being resolved and the cold war is ending. Although tensions remain in some other regions, several fierce armed conflicts have been brought to an end and the process of peacefully resolving some other conflicts has been initiated. The United Nations has played an important role in the process of conflict-resolution and peace-keeping and, thereby, made a tangible contribution to the maintenance of international peace and security, one of its main objectives. These positive developments in the world, in particular the rapprochement between East and West, have given strong impetus to arms limitation and disarmament efforts, especially in Europe.

The most tangible results so far have been achieved in the bilateral negotiations between the United States and the Soviet Union. In

December 1987, the Soviet Union and the United States concluded the first agreement in history—the INF Treaty—which provides for the destruction of a whole category of nuclear missiles, and as such represents a major breakthrough in the disarmament process. In terms of quantitative reductions of strategic nuclear weapons, significant progress has been made in bilateral START negotiations between the United States and the Soviet Union. The framework of an agreement signed at Washington in June 1990 at the summit meeting between President Bush and President Gorbachev-provides for a drastic cut in various categories of their strategic offensive arms. Their agreement to continue negotiations on further cuts and effective limitations on qualitative improvements in both strategic and tactical nuclear weapons is most important.

The United States and the Soviet Union have stated that reducing the risk of outbreak of nuclear war is the responsibility not only of the United States and the Soviet Union, but that other States should also make their contribution toward the attainment of this objeccive.

East and West are expected to reach an agreement on significant reductions of conventional forces in Europe that would facilitate additional cuts of other nuclear weapons stationed in Europe. In addition, several countries in both East and West—including the Soviet Union and the United States—are now unilaterally taking steps to reduce and to restructure their military forces.

Notwithstanding the bilateral agreements between the United States and the Soviet Union concerning nuclear weapons, their nuclear stockpiles will continue to be far in excess of those of the other nuclear weapon States for the foreseeable future.

Qualitative improvements of nuclear weapons have continued. Nuclear tests are still carried out, though at a reduced rate. The production of fissionable material for weapons purposes has been reduced. Most countries in the world consider that an early end to nuclear testing by all States in all environments would be an essential step towards preventing the qualitative improvement and the development of new nuclear weapons and would also contribute to the goal of non-proliferation. Most nuclear weapon States consider that their reliance on nuclear weapons for their security requires their continued tasting and do not agree that a comprehensive test ban is an urgent necessity.

The United States and the Soviet Union have agreed to continue to cooperate in the field of monitoring nuclear weapon tests. Multilateral and bilateral efforts to perfect verification methods for a comprehensive nuclear-test ban are important for achieving the ultimate complete cessation of such tests.

In the 1980s, the deployment of nuclear weapons at sea also became the subject of growing attention of many States. About 30 per cent of nuclear weapons are earmarked for maritime deployment. Sea-borne strategic nuclear weapons are subject to bilateral negotiations between the United States and the Soviet Union. This is not yet the case with regard to non-strategic sea-based nuclear weapons intended for targets at sea and on laud.

Another feature of the 1980s has been the preoccupation of many non-nuclear weapon States with the question of legal restraints on nuclear weapons, particularly as regards their non-use. Considering that, since 1945, no single nuclear weapon has actually been used, they believe that the de facto non-use of nuclear weapons might eventually serve as the basis for establishing a customary norm on the non-use of nuclear weapons. They believe that the different approaches to international customary and treaty law that relate to this matter deserve further consideration. Some nuclear -weapon States do not agree with this assessment.

There is a manifest conviction of the entire international community that a major nuclear war would have catastrophic consequences for the whole world. During the last decade, the nuclear powers have clearly stated their determination to avoid any nuclear conflict. This was most convincingly expressed both in the 1985 solemn declaration by former President: Reagan and President Gorbachev that "a nuclear war cannot be won and must never be fought" and in the statement by President Mitterrand that "nuclear weapons are weapons of non-use".

The Heads of State and Government of the North Atlantic Alliance confirmed on 6 July 1990 that they would "never in any circumstance be the first to use force", and announced that in a transformed Europe the Allies concerned would be able to adept a new strategy making nuclear forces truly weapons of last-resort.

In the last decade, the findings of several scientific studies about the possible effects of nuclear war, including the climatic effects subsumed in the concept of "nuclear winter", have added a new dimension to the discussion of the global consequences of nuclear war. These studies, *inter alia,* suggested that a nuclear war might cause more casualties than previously thought in countries other than those immediately involved.

The Chernobyl reactor accident in 1986, though not comparable to a nuclear detonation because it was only the source of radioactive debris and did not have the other effects peculiar to a nuclear explosion, provided a concrete demonstration of the magnitude of the consequences of even a relatively limited release of radioactive matter.

During the 1980s, the question of the contamination of the environment in connection with military and civilian nuclear activities, and the effects of such contamination, received increased public attention. In this regard, the work being done by the relevant national and international organisations is valuable in helping to understand the impact of these activities on health and the environment.

The momentous changes in the world, particularly in the East-West relationship, have diminished the threat of nuclear confrontation and made it possible to start a real process of reduction of nuclear weapons. The United States and the Soviet Union are engaged in far-reaching bilateral negotiations, which they have agreed should ultimately lead to the complete elimination of nuclear arms everywhere. Other nuclear weapon powers have stated that they would be willing to take part in the process of nuclear disarmament at an appropriate stage. Moreover, as recently reiterated by the Disarmament Commission, all States have the right and the duty to be concerned with and to contribute to efforts in the field of disarmament.

However, differences remain between States concerning mainly the timing and procedures for nuclear disarmament measures, on the one hand, and the existence and scope of international norms regarding nuclear weapons, on the other.

The nuclear non-proliferation regime is as important as ever. Its strict observance is of continued fundamental importance. Concern about nuclear proliferation remains acute, particularly in the light of technological developments that could make the acquisition of nuclear weapons by additional States easier, and in the light of the uncertainties surrounding the policies of some States, including some involved in regional rivalries and tensions.

Further efforts are necessary to prevent the acquisition or manufacture of nuclear weapons by additional States, to strengthen the international non-proliferation regime and to achieve wider participation in it. The regime would also be strengthened if NPT parties that have not already done so concluded the requisite safeguard agreements with IAEA.

The right of States to develop nuclear technology for economic benefit must be reconciled with the need to ensure against the further spread of nuclear weapons. Prior to any transfer of fissionable materials, nuclear equipment or know-how, acceptance of appropriate IAEA safeguards is an especially important part of the agreement between supplier and recipient.

To achieve the objectives of non-proliferation of nuclear weapons, global and regional efforts are needed, including those aimed at further strengthening the non-proliferation regime in all its aspects.

International security is now being perceived on the basis that reliance on military strength for national security will be increasingly supplemented by policies of confidence-building and wide co-operation in various fields, and negotiation and dialogue with the view to strengthening the security of all.

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GLOBAL NUCLEAR ISSUES IN THE ASIA-PACIFIC REGION

This study discusses whether and how security assurances affect political stability in geographic regions. Before embarking on what is necessarily a limited analysis of a complex subject. For centuries, vast areas of the world have been affected by forces used against them by more powerful States, which at one time or another incorporated large parts of them into overseas colonies or contiguous empires. The new factors are the emancipation of those areas into independent regions, made up of States that play their own parts in international affairs, and the possession by a handful of powers, outside or on the edge of those regions, of a specific form of superior force: nuclear weapons.

There are various reasons why most of those States are not in a position, or do not wish, to resort to defensive alliances or to acquire their own means to ensure that those weapons are not used against them. The majority of them look for political ways to do so, through promises made by the possessors of those weapons to refrain from using them or, if necessary, to come to the aid of States that have become, or are at risk of becoming, victims of their use.

Although the object of *nuclear* security assurances is new, the concept of security assurances is ancient The quest for common security has existed since human communities were first exposed to attacks by other groups. From time immemorial, any kind of social or political unit, any group of individuals living in close proximity, which saw its security threatened, sought protection from that threat, by its own means if possible, and by help from others if necessary. Whenever a given group sees that another group has the means to threaten its survival, it will look for ways to deflect that threat or to make sure that those means will not be used against it. If it is in a position to do so, it may seek to defend itself by becoming stronger than the potential adversary. Or it may try to reach an accommodation with that adversary, by asking it for a commitment not to attack, now known as a *negative* security assurance. Or it can look outside to a third group, with which it can either ally itself against the adversary, or from which it may obtain the promise that it will, under certain circumstances, come to its defence, a commitment now known as a *positive* security assurance.

History is replete with accounts of human groups seeking the protection of stronger groups, starting with farmers or villagers petitioning a strong overlord for protection against marauders or for assurance that he would not attack their farms or their village. At the next level, the local lord might call upon his duke to protect him from the nearby earl and guarantee the integrity of his fiefdom. The earl, in turn, might join with others of his kind to seek the protection of the king against the duke, or any other common enemy. Together with other States, a monarch might take his kingdom into an empire or an alliance against outside threats, on the understanding that the emperor would leave him alone or, in the case of the alliance, that the allies would refrain from attacking him. Each of those arrangements had its price; often, too, it was less the case of the group seeking protection from the stronger unit than of the latter imposing its protection on the weak. The overlord made his villagers work for the shield he extended over them or obliged them to become part of that shield. The feudal nobles who received shelter from their king paid for the privilege by service and tribute. The States that formed the empire did so at the expense of sovereignty and independence, and the price of alliance was reduced freedom of action and military or financial contributions.

In those cases one party possesses the means of power which another party lacks. Alternatively, one party suspects or fears the present or future existence of parties having such means and goes to another powerful party for active protection against attacks or threats. In each historical case, there is but a short distance between protection or non-aggression, on the one hand, and physical or political dominion, on the other.

A contemporary national variant of that theme occurs when a group of people refrains from particular actions or abstains from the possession of particular means of defence on the understanding that a specific entity will take those actions or possess those means of defence and use them on the group's behalf. Most modern-age municipalities maintain police forces to protect citizens from those who disrupt law and order, and any modern State has the means to protect its inhabitants from outside threats. The State provides its forces with the weapons needed for their tasks and the right to use them as appropriate. The citizens of the town or country are not supposed to have such weapons, or at least not to use them other than upon the say-so of the authorities. There is an understanding between authorities and citizens that the authorities will refrain from using violence against the citizens and will defend them when there is need.

The latter two examples have two elements in common: they combine “positive” protection against third parties and a “negative” promise of the more powerful entity not to harm the weaker. And they are bought at a price that may range from servitude to the non-possession of means of self-defence.

NPT and Security Assurances

The modern political world is obviously not organised like a national community and lacks the “social compact” inherent in a national or subnational entity, be that a medieval city-state or a major modern country. Its imperfect stability is based on a conglomeration of alliances, formal agreements and understandings among States, each seeking to maintain its integrity and security but differing widely from others in the means at its disposal. Nowhere is the difference more obvious than with regard to the possession of nuclear weapons. And nowhere is the issue of security assurances more relevant to the great majority of nations that feel exposed to the superior force of a few than in the context of nuclear weapons. The history of the Non-Proliferation Treaty (NPT) demonstrates the role which the concept of security assurances plays in current international relations.

Since the beginning of what is conveniently called “the nuclear age”, when it became obvious that nuclear means of mass destruction would play a role in the strategic relationship between countries, and particularly since the 1960s, when it became clear that the possession of nuclear weapons would not be limited to the two Super-Powers, States that did not have such weapons have looked for means that would save them from being attacked or threatened with them. Much of the motivation among non-nuclear weapon States for the creation of the NPT may be found in an attempt to achieve greater security in the face of that new peril. The negotiating history of the Treaty shows that a good part of the initial support for it among non-nuclear weapon States was generated by the thought that, as long as the nuclear weapon States had not divested themselves of their nuclear arsenals, their own best protection lay in security assurances, and by the suggestion that the Treaty would be the appropriate vehicle to convey them.

Thus, from the moment they began participating in multilateral negotiations on the instrument that would oblige them to abstain from the acquisition of nuclear weapons, non-nuclear weapon States have called for the establishment, either within the instrument itself or outside it, of formal and binding security assurances by the nuclear weapon States. That call did not come just from non-aligned States. Some States that enjoyed the protection of nuclear weapons, through membership in one of the major alliances of the cold war or by association with them, also championed their inclusion. Japan, for instance, was one of the States that sought such assurances from the beginning.

During the negotiations, the three participating nuclear weapon States adopted different approaches to the issue. When the Eighteen-Nation Committee on Disarmament (ENDC) discussed the text of the NPT in 1966 and 1967, most of the non-aligned members called for the inclusion of an undertaking by the nuclear powers not to use or threaten to use nuclear weapons against non-nuclear countries. The former USSR said that it was willing to include a clause that would prohibit the use of nuclear weapons against non-nuclear weapon States that were party to the Treaty and did not have nuclear weapons on their territory. The United States opposed the inclusion of such a provision, but said that a non-nuclear weapon State threatened with nuclear weapons would receive its strong support. With regard to the question of security assurances, the USSR, the United Kingdom and the United States declared that they viewed the matter in the context of action relating to the United Nations, outside the treaty itself but in close conjunction with it.

When in 1967, the Soviet Union and the United States submitted identical but separate drafts for a treaty, Nigeria, on behalf of a group of non-aligned countries, put forward a number of amendments, including one providing for security assurances. That was not accepted by the three nuclear weapon States, which held fast to the point of view that the issue was a matter for the United Nations and did not belong in the treaty.

Resolution 255: Positive Security Assurances

Accordingly, the three nuclear powers introduced in the ENDC a draft resolution on security assurances, which they undertook to submit to the Security Council in connection with the Non-Proliferation Treaty.

In that draft, the Security Council would recognise that aggression with nuclear weapons, or the threat thereof, against a non-nuclear weapon State would call for immediate action by the Security Council, above all by its nuclear weapon State permanent members, in accordance with their obligations under the Charter. It would then take note of declarations by certain States to provide such assistance immediately and reaffirm the inherent right, under Article 51 of the Charter, of individual and collective self-defence if an armed attack occurred. In that connection, the United States and the USSR advised the ENDC of their intention to make identical declarations that they would provide support in accordance with the Charter to any non-nuclear weapon State party to the NPT, if the draft resolution was supported by other nuclear powers, permanent members of the Security Council, which were also proposing to sign the NPT and would make similar declarations.

The resolution was adopted in the Security Council on 19 June 1968. It was followed closely by a conference of non-nuclear weapon States, where "measures to assure the security of non-nuclear weapon States" were at the top of the agenda. The Final Declaration of that Conference contained, in its first paragraph, the reaffirmation of "the necessity of further steps for an early solution of the question of security assurances in the nuclear era." Against that background, which also included various actions of the General Assembly along similar lines, the process of signature and ratification of the NPT, opened for signature on 1 July 1968, took place.

Further Moves

The positive assurances contained in the declaration by the three nuclear weapon States in connection with resolution 255 was welcomed in principle by non-nuclear weapon States, but was not considered adequate. The objections have since been summarised cogently in a memorandum prepared by Nigeria for the Fourth NPT Review Conference, in 1990. They are not basically different from those expressed twenty-odd years ago and are relevant to the subject of this study:

(a) The Security Council resolution did not define the nature of the action that would be taken against the delinquent State.

(b) The Security Council resolution and the declarations made by the three powers merely reaffirm the existing Charter obligations to provide assistance or support to a country that has been attacked, irrespective of the type of weapons employed.

(c) Positive security guarantees are incompatible with the non-aligned and neutral status of some non-nuclear weapon States.

(d) The nuclear threat can come only from a nuclear weapon State. Since all five nuclear weapon States are permanent members of the Security Council with the right of veto, any decision concerning military or non-military action against a delinquent State would be impossible, since it is unlikely that an aggressor would consent to the taking of collective action against itself.

The question of security assurances has remained an important aspect of multilateral discussions on arms limitation and disarmament. It has played a role at the four Review Conferences of the NPT that were held in the period 1975-1990 and has figured prominently at each special session of the United Nations General Assembly devoted to disarmament. Especially during the early stages of this debate, attention tended to focus mainly on the negative security assurances. Binding negative security assurances by nuclear weapon States have become essential parts of nuclear weapon free zone arrangements. Such assurances have been incorporated into Protocol II of the 1967 Treaty of Tlatelolco, covering Latin America and the Caribbean, and into Protocol 2 of the 1985 Treaty of Rarotonga, covering the South Pacific. Not all nuclear weapon States have given assurances in respect of both Protocols, and some assurances are accompanied by reservations. The nuclear weapon States have also made a series of unilateral declarations setting out the conditions under which they undertake not to use nuclear weapons against non-nuclear weapon States. Those declarations vary in specific ways, and none is given in an unambiguously binding manner. Shortly before the start of the 1995 Review and Extension Conference of the NPT, the five nuclear weapon States once again made a series of declarations at the Conference on Disarmament in Geneva, very much on the same lines as before. As the non-aligned nations made abundantly clear at the Conference, those declarations once again failed to meet their demand for uniform and legally binding assurances that would have formal status.

Possibly the most representative expression of the issue is contained in the Final Document of the first special session, held in 1978. Paragraph 32 reads in part, “while noting the declarations made by nuclear weapon States, effective arrangements, as appropriate, to assure non-nuclear weapon States against the use or the threat of use of nuclear weapons could strengthen the security of those States and international peace and security”. Paragraph 59 calls on the nuclear weapon States “to take steps to assure the non-nuclear weapon States against the use or threat of use of nuclear weapons. The General Assembly notes the declarations made by the nuclear weapon States and urges them to pursue efforts to conclude, as appropriate, effective arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons".

The memorandum which Nigeria submitted at the Fourth NPT Review Conference served to convey to that Conference a draft agreement on the prohibition of the use or threat of use of nuclear weapons. That document calls for an undertaking not to use nuclear weapons against a party to the NPT which does not belong to a military alliance and does not have other security arrangements providing for mutual defence with a nuclear weapon State. It is relevant to the discussion in this study to mention that the draft also provided for non-use of nuclear weapons against any non-nuclear weapon State party that belongs to a military alliance or has other such security arrangements, as long as it has no nuclear weapons on its territory and promises not to take part in a military attack on any nuclear weapon State party to the agreement or any of its allies.

It is fair to say, and it has often been maintained by political analysts from non-aligned nations, that the internal security of the Western world seems to improve while the developing parts of the world are in greater need than ever of the means to protect their security. The end of the cold war does not seem to have ended that disparity as yet. In some respects the contrasts between the two groups of States may have grown: the end of the nuclear threat among the major powers has improved their security, but it may also have reduced their interest in the fates of non-aligned nations with whose well-being they may formerly have been more actively engaged. The decrease in global tension, however, may have created conditions more favourable to agreement on measures to improve the security of non-nuclear weapon States; one might suppose that the nuclear weapon States might now be less averse to the adoption of such measures than some of them may have seemed to be under more tense conditions. The non-aligned nations however, have continued, and indeed intensified, their search for means to compensate for that inequality through arrangements that would promise them freedom from nuclear threats and offer them protection.

Regional Aspects

In the following sections, the regional dimension of security assurances is discussed mainly in the context of nuclear weapon free zones. Those zones are not the only means of enhancing regional security, but they are the most prominent. Nuclear security assurances relate to the non-nuclear status of a region; it is mainly through the creation of such zones that participating States obtain security guarantees.

The pursuit of negative security assurances became the immediate focus of non-nuclear weapon States. Over the years, however, the issue of positive security assurances has gained in importance. That development seems to be connected with the emergence of new de facto nuclear weapon States since the NPT was opened for signature. The importance some non-nuclear weapon States attach to positive guarantees is proportional to the security situation in their specific region and particularly to the presence of States with a nuclear weapon capability. Israel's suspected multi-weapon nuclear arsenal may have prompted Egypt to submit to the Fourth NPT Review Conference a working study calling for the adoption by the Security Council of a new resolution that would go beyond resolution 255 (1968). *Inter alia,* it specified the mandatory action to be taken by the nuclear weapon States in the case of a nuclear attack on a non-nuclear weapon State party to the NPT and obliged States to provide immediate assistance to the victim. Similarly, Pakistan, with India in mind, has expressed interest in a nuclear weapon free zone arrangement in its region, which would be guaranteed by all five recognised nuclear weapon States. Ukraine acceded to the NPT on the condition that it would receive negative and positive assurances; its main concern seemed to be the Russian Federation, which in fact joined the other nuclear weapon States in complying with Ukraine's demand. India is the one State situated in a region fraught with nuclear rivalry that opposes the creation of a nuclear weapon free zone there, and might, by implication, be seen to have rejected security assurances in that region. It has expressed the view that it could not participate in a nuclear weapon free zone arrangement unless China did so, too; China's unconditional assurances do not seem to have convinced it.

One aspect of positive security assurances that must not be overlooked is the possibility that their application may affect, i.e., detract from, the independence of the State or States to which they apply. In that respect, positive security assurances may serve the interests of the guarantor as much as, or even more than, those of the beneficiary. The Nigerian memorandum referred to above came close to saying so when it pointed to the difficulty of reconciling non-aligned or neutral status with the acceptance of positive security assurances. Of course, negative security assurances may also come at a price, in that they tend to be conditional upon the guarantee of being non-nuclear, i.e., they are given to States that either join a nuclear weapon free zone or are parties to the NPT. Either condition subjects them to a verification regime that monitors their compliance.

If a conclusion can be drawn on the basis of the relatively scant evidence so far available, it would seem to be that nuclear weapon States find it easier to commit themselves in a legally binding manner to security assurances in specific cases or in regional situations than in a wider, more general context. While they have usually expressed their willingness to extend assurances to nations that show their non-nuclear status by adhering to a global instrument like the NPT, they have not so far been able to agree on the text of any treaty provision in that regard. The binding assurances they have given so far have been extended mainly in the framework of nuclear weapon free zones, notably the Treaties of Tlatelolco and Rarotonga. They have also found themselves constrained by circumstance to give assurances to individual States; recent examples are Belarus, Kazakhstan and Ukraine, which have given up their “semi-nuclear weapon status” in return for specific security assurances, among other things, and the Democratic People’s Republic of Korea, which has demanded security assurances as part of the price for stepping back from a presumed nuclear weapon programme. The non-nuclear weapon States have for many years called for uniform commitments from the nuclear weapon States in an instrument applicable under all circumstances. Whether in the framework of the NPT, in a nuclear weapon free zone, or as the result of an individual commitment, the common motivation of the non-nuclear weapon States involved in demanding security assurances is their wish to compensate for the loss of security they might suffer by relinquishing certain options. The arguments that convince the nuclear weapon State concerned to give security assurances, however, may vary from case to case.

On occasion the interests of the non-nuclear weapon States may be very different from those of the nuclear powers, especially with regard to specific regional arrangements. The South Pacific Nuclear Free Zone Treaty, whose additional protocols have not been subscribed to by all the nuclear weapon States to which they are addressed, is a case in point. Here is an illustration of how States in a region have sought to enhance security by banning nuclear weapons from their area, while nuclear weapon powers, for their own strategic reasons, have simply refused so far to give the assurances required to make the scheme a practical reality.

Any State that possesses a superior weapon will resist attempts by others to constrain its use. Security assurances constitute a limitation on the use of nuclear weapons. That may explain the reluctance of some nuclear weapon States to commit themselves to binding, formalised security assurances. It is also the reason why they have traditionally adopted a cautious attitude to the concept of nuclear weapon free zones: such zones, combined with negative security assurances to their member States, obviously hamper the unlimited deployment of nuclear weapons in large areas of the globe. An exception to the empirical rule that the strong tend to hesitate to commit themselves in advance not to use their strength is the case where such a commitment helps to enhance their own security situation. The promise by nuclear weapon States to extend security assurances to States that join the Non-Proliferation Treaty indirectly also serves their own security interests. But, as we have seen, not all nuclear weapon States consider each nuclear weapon free zone arrangement conducive to their security, and some therefore may not be ready to extend security guarantees in such a framework.

This may cause a problem. As was once again demonstrated in the recent declarations by nuclear weapon States, the latter are generally inclined to give negative security assurances to parties to the NPT, but since such assurances are neither legally binding nor uniform, they do not meet the requirements of the protocols of nuclear weapon free zone arrangements. Therefore, nuclear weapon States that see a security interest in retaining the non-nuclear weapon status of a given zone are practically obliged to extend specific, binding assurances in the context of the zonal agreement in question.

As long as there is no multilateral legal instrument to codify nuclear weapon States' security assurances in a universally valid form, and though nuclear weapon States may view a particular regional arrangement with different degrees of benevolence, the most viable solution to the demand of non-nuclear weapon States for such assurances still lies in the kind of undertaking which they may expect to receive as parties to a nuclear weapon free zone arrangement. Under such an arrangement a group of States, all of which would clearly have had to adopt a nuclear weapon free policy, could probably count on receiving at least negative security guarantees from all the nuclear weapon States. In other words, for the foreseeable future the search for a binding and, if not uniform, at least clear security assurance seems most likely to be satisfied through membership in a nuclear weapon free zone.

Of course, the relationship between security assurances and regional issues is not defined only by the concept of nuclear weapon free zones. It appears that the establishment of zones can serve to elicit security assurances, but so can the adherence of all States of a region to the NPT or to any other legal instrument that conveys the obligation not to have or to make nuclear weapons and imposes a multinational system to monitor compliance with that obligation. For the purposes of this discussion, it will be assumed that the complete denuclearisation of aregion, under whatever name, can qualify it as an area to which security guarantees will tend to be extended.

Security Assurances and Regional Stability

That assumption, however, does not answer the question of whether the denuclearisation of a region enhances its stability, nor does it say anything *per se* about the effect of security assurances in this context. One can assume that, by levelling the regional playing-field, denuclearisation contributes to stability in the area. One can also share the assumption made by participating States that security assurances are a *conditio sine qua non* of the nuclear weapon free zone and are therefore, by extension, good for regional stability. That brings around once again the "negative" and the "positive" aspects of security assurances, as well as the disparity between the general interests of non-nuclear weapon States and the specific aims of nuclear weapon States. Though it is difficult to devise a generally applicable rule—geographic, political and strategic conditions vary between regions, and conditions do not stay the same forever—there are, however, some aspects that may have universal application.

Negative Security Assurances: A Minimum Requirement

It is reasonable to assume that the extension of negative security assurances in the framework of a nuclear weapon free zone adds to security and stability by helping to keep the regional playing-field level. Yet, not all nuclear weapon States apply their assurances in the same way. As we have seen, their assurances all differ somewhat, and a number of them have been made with specific reservations. There is also no absolute guarantee that the nuclear weapon States will live up to their undertakings if their own security is affected. While it is fair to say that stability in a region cannot be founded on negative security assurances alone, they should nevertheless be viewed as a minimum requirement.

Positive Security Assurances: A Reinforcing Factor

Positive security assurances extended to a region play a different role. Positive assurances serve one of two purposes: either they may be extended to protect the region against nuclear violence from outside, or they may be directed at a particular State in the region. That has important repercussions for the way security assurances should be applied if regional perturbations are to be avoided, and it merits a few additional remarks.

The first situation implies that the region is a nuclear weapon free zone, or consists of States that are all parties to the NPT, or includes States subject to full-scope safeguards by virtue of any similar undertaking. Should nuclear weapon States not be convinced of the non-nuclear weapon status of all the countries in the region, they could not be presumed to be willing to extend positive security assurances to the region as a whole. In fact, unless a nuclear weapon free zone arrangement specifically requires it or includes provisions that go beyond Security Council resolution 255 (1968) and the declarations made by the depository States, there seems to be little sense in extending positive assurances to a region as such, as the countries concerned would in any case benefit from such assurances in consequence of that resolution.

If the region is not yet a nuclear weapon free zone, a demand for positive security assurances by countries in the region would be made with the establishment of such a zone in mind and would be aimed specifically at countries within the zone that are suspected of possessing a nuclear capability. Again, one may assume that the existence of such assurances would not by itself suffice to establish the zone unless they resulted in the suspected State's fully joining the zonal arrangement as a demonstrably non-nuclear State. That would probably only occur if the positive assurances were strong enough to deprive the State concerned of any incentive to develop or maintain a nuclear arsenal. This, however, would amount to the de facto extension of the kind of nuclear protection or "umbrella" that the Super-Powers have traditionally held over close allies under their respective cold war alliances. Indeed, an arrangement of that kind would amount to an alliance. It would almost certainly have to be selective, i.e., it would apply to only one or two or a few of the States in the area, and it would probably not be acceptable to other States in the region. It is unlikely that more than one or two of the nuclear weapon States, would be willing to join such arrangement, and if they did, they might well do so under widely varying conditions. Far from contributing to regional stability, therefore, that kind of assurance (the term "guarantee" might be more appropriate) would tend to be destabilising.

There are reasons for assuming that nuclear weapon States will not be inclined to extend security assurances to regions that are not clearly non-nuclear. Logically, the requirement for the extension of security assurances, i.e., "real" denuclearisation, would mean that a nuclear weapon free zone could not include a threshold State. Conversely, that would also mean that positive security guarantees could not be used within a region and were, therefore, not applicable as a way to establish a nuclear weapon free zone in a region where one country was suspected of having a nuclear capability. In principle, however, nothing would prevent individual States in a given region from asking for positive security guarantees as a step towards the denuclearisation of that region. In such a case, to stay within the purview of this study, one might assume that the purpose of the call for security assurances is the improvement or establishment of stability in a region that is probably relatively unstable. To what extent the invocation of positive security guarantees under such circumstances would have a constructive effect remains to be seen. One wonders also what nuclear weapon State would be tempted to take responsibility for a step that might heighten tensions unless that step has been agreed to by a large majority of States in the region.

Viable Variations?

A related question is whether nuclear weapon States would feel constrained from extending security assurances to the members of a denuclearised region that includes a non-nuclear ally of a nuclear weapon State. In the case of the Rarotonga Treaty, two parties, Australia and New Zealand, are also members of a defensive alliance with the United States. The latter has not extended the security assurances demanded by the Rarotonga Treaty, but it is interesting that other States, not associated with that alliance have done so. There are no indications that regional stability is at all affected by that situation, which would indicate that the answer to the question is dictated by political and geographic circumstance. A case that was never put to the test was the initiative of the former Soviet Union for a nuclear non-use zone running in a North-South direction through Central Europe. One of the purposes of the scheme was said to have been to disqualify as viable NATO members Western States through whose territory the zone would run. The plan never had a chance to succeed; it is mentioned as an example of a case where the extension of security assurances by either side might have had a disastrously destabilising effect.

One more question is what effect security assurances might have in the case of a zone that is physically part of an area that comprises a nuclear weapon State. Under the circumstances prevailing in South Asia, one might reason that security assurances by exterior States would have to take into account the involvement of China, and that China's own assurances, as a party in regional matters, could hardly be credible. India's reaction to Pakistan's proposal to establish a nuclear weapon free zone in the area, with China, Russia, the United Kingdom and the United States as guarantors, was that such a zone would not be possible unless China itself could become a member. The regional equation has three nuclear factors: China, India and Pakistan, among which China and India are adversaries, as are India and Pakistan, while China and Pakistan are friends. Under such complicated circumstances, the role security assurances would play is hard to assess. The United States is in a different situation with regard to the Treaty of Tlatelolco. It has good relations with most of its neighbours. It is the only nuclear weapon State in the area. The only State with which it has serious political problems is Cuba, which does not pose a strategic threat and may well join the Treaty soon. The principal effect of the assurances that have been given pursuant to the Treaty seems to have been wide acceptance. That has been an important factor of stability in the region. In that light, the answer to the question posed at the start of this paragraph seems to be that the effect security assurances have on regional stability in an area that contains a nuclear weapon State will depend on the basis of that stability, its nature, the factors that threaten it and the conditions that may help it to survive or become stronger.

If the above definitions are accepted in regions that do not have nuclear weapon free zones, security guarantees could be extended only to individual States. Such assurances might well become a disturbing factor. A given region may, for instance, contain a nuclear-threshold country that is not a party to the NPT and would thus not benefit from more general security assurances. In the case of a conflict between such a country and an NPT party, a question might arise as to whether and how such guarantees would be applied if the NPT party were the aggressor, all the more so if the victim of the aggression is an ally of one of the nuclear weapon States that extended the security assurance. Another problem might arise if the non-party to which the assurances are not extended is clearly a non-nuclear weapon State and receives a nuclear threat from another non-party. In a properly verified nuclear weapon free zone that situation could not arise.

A Non-Nuclear Digression

This study has so far dealt only with the issue of actual or potential *nuclear* conflict. The question of whether and how regional stability in an area that is not a nuclear weapon free zone is affected by aggression by *conventional* means against a State closely associated or allied with a nuclear weapon State which has extended assurances to every country in the region, or at least to both sides in a conventional conflict, was raised by Nigeria in the draft resolution it proposed at the Fourth NPT Review Conference. If the guarantor is a nuclear State that has adopted a non-first-use policy, the situation is no different from what it would be if either party were allied to some other powerful non-nuclear weapon State. If the nuclear weapon State has no such policy, the question is whether it has extended only a positive or also a negative assurance. If the latter, regional stability should not be upset more than by any other conventional conflict in the area. That, however, may be no more than a hope: no matter what assurances they may have given, nuclear weapon States that see their friends threatened may rattle their nuclear sabres anyway. The Nigerian draft resolution of 1990 may point the way.

Some Final Observations

This, then, is another possible conclusion: regions may be subject to conflicting power extensions from within as well as without. Individual countries may seek protection in open or implicit alliances with nuclear powers outside the region. Unless positive security assurances are uniformly extended to all States in the region, they will not contribute to the stability of the area.

In more general terms, there is much overlap between the global and regional aspects of security assurances. Because of the nature of the weapons with which they deal, security assurances affect individual States, regions and world-wide strategy.

The discussion of security assurances goes on unabated, in many venues. They are a subject of global arms control politics and form a very practical aspect of regional security.

Discussions so far have not been very productive. The political arguments used are frequently more ritualistic than realistic. At least in their public utterances, many non-nuclear weapon States present the case for security assurances as a price for adherence to regional or world-wide denuclearisation or non-proliferation measures as a means to help offset such adherence, given the continued possession of nuclear weapons by the nuclear weapon States. In response, nuclear weapon States tend to claim that the denuclearisation arrangements to which the non-nuclear weapon States refer serve their interests as much as anyone else's, and should not be held hostage to the form or content of security assurances. Some of the nuclear weapon States have long been inclined to give preference to positive security assurances over negative ones, but they are now taking a more benevolent view of the latter as an element of nuclear weapon free zones.

The time may have come to switch the dialogue from a mainly political to a more analytical and practical approach. The conversation might become more productive if actual or potential recipients of security assurances perceived them as latent strategic assets of unproven value. For the guarantor, to whom security assurances may present restrictions on scope of action, it might be helpful to realise that they also delineate the playing-field more precisely and that, above all, they contribute indirectly but importantly to international stability and security by promoting non-proliferation.

Security assurances are no cure-all. Their impact may vary. Their utility under various conditions should be ascertained, and they should be formulated so as to make them as useful and reliable as possible, acceptable both to recipients and guarantors. They should be handled with great care, as concrete factors in international relations, rather than as political arguments. They need more dispassionate consideration and study.

REGIONAL APPROACHES TO ENHANCE NUCLEAR TRANSPARENCY

The end of the cold war had a significant impact on nuclear disarmament and non-proliferation. It was evident that the two Super-Powers possessed nuclear weaponry far in excess of their needs; both countries have started the process of nuclear arms control and nuclear disarmament. Table 1 estimates the current number of nuclear weapons of the two major powers and the other three nuclear weapon States (NWS).

Post-Cold War Problems

While nuclear disarmament progressed significantly after the end of the cold war, new problems arose in the area of non-proliferation.

On the positive side, the conclusion of START I and II offers good prospects that the nuclear arsenals of the United States and the Russian Federation will be reduced to 3,000-3,500 warheads each by the year 2003. The NWS, with the exception of China, are continuing their moratoriums on nuclear testing. A comprehensive nuclear test ban treaty (CTBT) is under negotiation in the Conference on Disarmament in Geneva, though the pace of work has been somewhat slower than expected. Negotiations are to begin shortly on a treaty on the prohibition of the production of nuclear material for weapons purposes (cut-off treaty), called for by President Clinton in September 1993.

Very serious problems, however, have emerged in connection with the dismantlement of nuclear weapons. Nuclear materials released from nuclear weapons have to be disposed of by the least environmentally dangerous methods, and, if possible, in a way beneficial to economic development. Security and safeguards associated with storage, disposal or subsequent use must be maintained effectively. Are there any effective measures to deal with the illicit trafficking of plutonium and highly enriched uranium? Or to ensure that land and sea are not contaminated by the dismantlement of nuclear submarines? If a brain-drain is to be avoided, ways must be found to help nuclear scientists of the former Soviet Union who have lost their jobs. The international community will have to resolve those difficult problems soon.

We shall have to exert further collective efforts to strengthen non-proliferation. Though the number of NWS has not increased, the number of so-called threshold States has. In that connection, the international community has gained experience by dealing with such cases as Iraq and the Democratic People's Republic of Korea.

TABLE 1

Estimated Number of Nuclear Weapons as at January 1994

United States	
ICBM	2,200
SLBM	3,072
Heavy bomber	3,060
LANCE	20
Nuclear cannon	5,080
SLCM	many
ALCM	1,860
SRAM	1,100
Tactical bomb	4,125

Commonwealth of Independent States (CIS)	
ICBM	6,065
SLBM	2,384
Heavy bomber	1,374
Short range nuclear bomb	900
Land-based missile	4,300
GLCM	40
Nuclear cannon	6,085
Tactical bomb	many
United Kingdom	
SLBM	100
Tactical bomb	100
France	
Land-based missile	68
SLBM	384
Tactical bomb	60
China	
ICBM	4+
Middle-ranged missile	56
SLBM	24
Tactical bomb	150

Nuclear Disarmament and Non-Proliferation

When considering nuclear disarmament or a total ban on nuclear weapons, both vertical proliferation (i.e., nuclear disarmament) and horizontal proliferation (so-called non-proliferation) need to be considered. In Japan those two types of proliferation have tended to be discussed by different groups of experts: arms control and disarmament by international political scientists and military/arms control experts, and non-proliferation by civilian nuclear engineers and scientists. I am a nuclear scientist, and my field of expertise is nuclear safeguards and physical protection technology. As concerns have grown about both types of proliferation, I have also become involved in discussions on various measures to accelerate nuclear disarmament. In this study I have touched upon some aspects of arms control and disarmament, but I shall concentrate mostly on horizontal non-proliferation.

Peaceful Uses of Nuclear Energy and Non-Proliferation Measures

Since President Eisenhower's "Atoms for Peace" declaration, at the General Assembly in 1953, many countries have made efforts to commercialise the peaceful uses of nuclear energy, especially nuclear-power generation. In 1993, 17.5 per cent of electric power generation throughout the world was supplied by nuclear energy. Table 2 illustrates the situation with respect to nuclear-power generation in various countries. The United States has more than one hundred nuclear power stations in operation and generates the largest amount of electricity in the world. France, Japan, Germany, the Russian Federation, Canada and the United Kingdom, in that order, are the major nuclear power States in terms of quantity of electricity generated. The ratio of nuclear power to total power generation gives us a different picture. Lithuania, France, Belgium and Slovakia, in that order, rely on nuclear power for more than 50 per cent of their electricity generation. The United States relies on nuclear means for a little over 20 per cent of its power generation.

Historically the initial centre for the development of peaceful uses of nuclear energy was the United States. The major supplier of information at the first world-wide conference on peaceful uses of nuclear energy in 1956 (first Geneva Conference) was the United States. As time passed, the centre of nuclear energy development for civilian use gradually shifted to Europe—the 1970s and 1980s could be considered the age of Europe. The next century may be known as the age of Asia. Japan is the third nuclear power in the world; the Republic of Korea's nuclear power is a full 40 per cent of its total electricity generation. Both countries plan to expand their nuclear power programmes. China has announced a very ambitious expansion of its nuclear power programme. The South-East Asian countries have shown keen interest in developing their domestic nuclear power stations.

Two key technologies should be considered with respect to possible diversion of nuclear material from peaceful uses to nuclear weapons—enrichment and reprocessing.

Light water reactors, the ones most widely used nowadays, require 3 to 4 per cent light enriched uranium (LEU) as fuel. The enrichment technology to be used for LEU could be misused for production of highly enriched uranium, HEU>90 per cent, which is necessary for the production of nuclear weapons. Gas-cooled reactors (GCR) and heavy-water reactors (HWR) like CANDU do not require enriched uranium; natural uranium is enough. It might be desirable to choose this process for lowering the possibility of the misuse of enrichment technology. But, plutonium (Pu) produced after being burnt in the reactor core of HWR or GCR can be used more easily for weapon purposes. Pu separated from LWR has a high burn-up potential and contains a high ratio of Pu-240, Pu-241 and PU-242, which have undesirable physical properties for weapons production.

TABLE 2

Electric Power Generation by Nuclear Power Stations and their Share in the Total Generation

	1992		*1993*	
	X10^8 kwh	*Percentage*	*X10^8 kwh*	*Percentage*
Lithuania	156	80.0	123	87.2
France	3,217	72.9	3,502	77.7
Belgium	409	59.9	395	58.9
Slovakia	111	49.5	110	53.6
Hungary	131	46.4	130	43.3
Slovenia	38	34.6	38	43.3
Sweden	608	43.2	589	42.0
ROK	565	43.2	554	40.3
Switzerland	221	39.6	220	37.9
Bulgaria	116	32.5	140	36.9
Spain	534	36.4	536	36.6
Taiwan	325	35.4	330	33.5
Ukraine	710	25.0	752	32.9
Japan	2,170	27.7	2,463	30.9
Germany	1,500	30.1	1,450	29.7
Czech Republic	123	20.7	126	29.2
United Kingdom	591	23.2	798	26.3
United States	6,188	22.3	6,103	21.2
Canada	760	15.2	886	17.3
Argentina	66	14.4	72	14.2
Russian Federation	1,196	11.8	1,192	12.5
Netherlands	36	4.9	37	5.1
South Africa	93	6.0	72	4.5
Mexico	39	3.2	37	3.0
India	56	3.3	54	1.9
Pakistan	5	1.2	4	0.9
Kazakhstan	5	0.6	4	0.5
China	5	0.1	25	0.3
Brazil	18	0.7	4	0.2
Total	20,274	16.7	20,935	17.5
Global total	121,680		119,480	

The major framework for the consideration of global non-proliferation at the early stages of nuclear development was in the form of bilateral agreements between supplier States (e.g., the United States and the United Kingdom) and recipient States. Those agreements contained various supplier's rights, including bilateral safeguards, prior consent on reprocessing and transfers to third countries.

The International Atomic Energy Agency (IAEA) was established in 1957. One of its major roles was to carry out safeguards and inspections. It took time, however, for the Agency to develop an effective safeguards system. The first comprehensive document to implement safeguards procedures was INFCIRC/66/Rev.2 of 1968. The suppliers' right to employ bilateral safeguards was transferred to the IAEA upon the conclusion of trilateral agreements between the supplier, the recipient and the Agency.

The Nuclear Non-Proliferation Treaty came into force in 1970 and has become the fundamental instrument to promote world-wide nuclear non-proliferation. The IAEA was asked to administer safeguards based on article III of the Treaty. The safeguards procedure was contained in INF-CIRC/153 and applies to the entire fuel cycle of the non-nuclear weapon State concerned.

The global nuclear non-proliferation regime established by IAEA now covers a complex of measures. Apart from the NPT and IAEA safeguards, regional treaties, such as the Tlatelolco Treaty covering Latin America and the Caribbean and the Treaty of Rarotonga in the South Pacific, export controls on sensitive items (London Suppliers' Guidelines), and the Convention on the Physical Protection of Nuclear Material in 1980 (aimed at preventing theft and unauthorised removal of plutonium), are the main components of the regime.

The non-profileration regime was created during the cold war. The main targets were those States with advanced nuclear fuel cycles, such as Germany, Italy, Japan and Sweden. States with advanced fuel cycles were subject to more stringent implementation of IAEA safeguards. History has shown, though, that concerns about proliferation arose in other parts of the world. The concern of the international community turned to those States which had not yet fully established civilian nuclear fuel cycles and which might want to develop independent, clandestine military facilities. Israel, Pakistan and South Africa, and, to some extent, India, fell into that category. Faced with significant changes in the international political and social situation, the effectiveness of traditional global non-proliferation efforts needs to be re-examined to meet the current situation. One improvement would be to enhance transparency in the civil uses of nuclear energy.

Enhancing Transparency

The definition of the word "transparency" is still under debate. It can be used differently when speaking of arms control or of non-proliferation. Increasing transparency in the field of peaceful uses of nuclear energy has been widely discussed. Experts consider that enhancing transparency in safeguards implementation is one way to strengthen the international safeguards regime. It is also generally accepted that enhancing transparency in respect of nuclear-related activities contributes to global non-proliferation and promotes peaceful nuclear energy development.

Transparency was central to the deliberation of the Japanese Long-Term Nuclear Energy Development Programme in 1994. Japan has made steady progress in the civil use of nuclear energy with its research and development programme. It believes that plutonium recycling can be beneficial if controlled from the safety and non-proliferation point of view. Japan's new programme continues to favour the Fast Breeder Reactor Project, the construction of a commercial reprocessing facility and research activities associated with plutonium recycling.

Only a few States, however, still pursue plutonium reutilisation. The United States originally had promoted actively Pu-recycle technology. President Carter changed United States policy, and since his time no large project has been initiated to promote the utilisation of plutonium in civil use. In Europe, France still engages in research on actinide utilisation. The United Kingdom and France both continue to reprocess spent LWR fuel. Switzerland and several other States still use Pu-bearing fuel in LWRs. Generally speaking, however, major programmes involving Fast Breeder Reactors have been cancelled.

Under those circumstances, and bearing in mind the highly unstable political situation on the Korean peninsula, Japan's Pu utilisation programme has been gravely misunderstood by United States and European experts. They suspect that Japan has not given up its Pu programme because it does not want to abandon the option of developing a nuclear arsenal. That point of view was expressed, for example, in the introduction to the section dealing with East Asia and Australasia in the publication entitled *The Military Balance 1993-1994.* In order to allay such suspicion, Japan's Atomic Energy Commission (JAEC) has proposed the incorporation of more transparency measures into Japanese nuclear policy.

Regional Approaches to Enhance Transparency

There are various measures to strengthen non-proliferation of nuclear weapons. Table 3 shows actual measures already taken or under discussion based on the type

Table 3

Various Measures for Non-Proliferation

1. Nuclear Disarmament

	Unilateral	*Bilateral*	*Regional*	*International*
Arms control and disarmament		SALT INF START		
Nuclear test ban	Voluntary declaration			PTBT CTBT
Cut-off of production	Voluntary decision			Cut-off Treaty
No first use	Unilateral declaration			
Export control (missile)				MTCR
Nuclear weapon free zone		(Korean Peninsula?)	Latin America South Pacific Antartica	

2. Non-Proliferation

	Unilateral	*Bilateral*	*Regonal*	*International*
Prohibition of production, possession etc. of nuclear weapons	(Korean Peninsula?)	Latin America South Pacific Antartica	NPT	
Safeguards	(Voluntary NWS)	ABACC (Brazil/ Argentina Bilateral Agreement)	EURATOM	IAEA
Export control		Bilateral Agreement		London Suppliers' Guidelines
Physical protection		Bilateral Agreement		Convention on the Physical Protection of Nuclear Material
International control of Pu./ HEU				(IPS) (Informal meeting of 9 States)

approach adopted. With more than 175 States parties, the NPT is the most important international measure to secure non-proliferation in the world. It is the treaty with the widest adherence in the field of disarmament. That the NPT has its shortcomings, however, is clear. Because of its discriminatory nature, some major actors in the world will not adhere to it—India, Israel and Pakistan, particularly.

In a way, IAEA safeguards are a window opened to the outer world. Through the inspections it conducts, the Agency can obtain information and confirm that a State's activities remain peaceful. In other words, safeguards activities are actions to increase transparency through international means.

If international means cannot be applied for some reason, a regional or bilateral approach may be introduced instead. While maintaining the use of international means, a regional approach could be also be adopted in order to increase and upgrade the effectiveness of the whole system.

The Tlatelolco Treaty, which denuclearised Latin America and the Caribbean, and the Rarotonga Treaty, which did the same for the South Pacific, are two good examples of a regional approach. Negotiations are under way on a nuclear weapon free zone in Africa. Similar regional approaches could work for South-East Asia, for the CIS countries (except Russia), or even for South Asia, including India and Pakistan, or the Middle East, including Israel. If such regional schemes could be put in place, transparency could be enhanced and the overall non-proliferation regime would be greatly strengthened.

A Regional System in Asia

In contrast to Europe, Asia has made few region-wide efforts in the field of security. There is no organisation similar to NATO in the region, nor is there a EURATOM controlling the civil use of nuclear energy and ensuring non-proliferation. Asia is more heterogeneous than Europe, culturally, ethnically, politically, religiously and technologically. It lags behind in the use of a regional approach in the field of disarmament. Nonetheless, there is an interest in examining the application of such a concept in the Asian situation. For example, the revitalisation of Asia-Pacific Economic Cooperation (APEC) and the creation of the ASEAN Regional Forum could be reinforced.

Recently, the "ASIATOM" concept has been attracting wider attention in Japan. I should like to analyse, first, the reasons for the heightened interest, and second, the possible operative mode of such a concept.

The reasons for promoting that concept vary among its supporters but could be summarised in the following way:

(a) The Asian region has begun to accelerate nuclear energy development. ASIATOM is needed as an organisation to promote regional cooperation and coordination in the research and development of peaceful uses of nuclear energy;

(b) The need for sensitive technology, such as enrichment or reprocessing, will increase along with the development of the commercial nuclear fuel cycle. It would be useful to examine the possibilities of finding a regional solution, such as a regional fuel-cycle centre;

(c) A body to coordinate national policy on nuclear energy development in Asian countries could be considered as a centre for clearing information on nuclear activities, thereby enhancing transparency and decreasing instability in the region;

(d) Upgrading the level of nuclear safety, radiological protection, nuclear material control, and physical protection in Asian countries could be envisaged;

(e) The creation of a regional safeguards system, similar to EURATOM, could lessen IAEA's burden of implementing safeguards; and

(f) Such a system could contribute to the upgrading the level of collective security in the Asian region. It could have an effect similar to that of the nuclear free zone concept, depending, of course, on its member States.

Though some say it is possible, others have argued that ASIATOM could not duplicate EURATOM. In my opinion, Asia will find an Asian way, at least initially. The heterogeneous nature of Asia would make it difficult to create a predetermined organisation. In my view, an information exchange could be accelerated, and close consultation could be encouraged in various areas. Currently the Japan Atomic Energy Commission holds a regional conference every year on cooperation in nuclear research and development. The themes discussed at that forum are restricted to the utilisation of radiation in the fields of medicine and agriculture and to the use of research reactors. But, the range of topics could be expanded in the future. Policy discussions among member States have just begun. That forum, for instance, could act as a key structure for the coordination of national nuclear energy policies.

I personally would like to see close cooperation and an information exchange on nuclear material control, domestic safeguards and physical protection of nuclear material among three States in Far East: Japan, with its complete domestic nuclear-fuel cycle, including more than 40 power reactors, enrichment plants and reprocessing facility; the Republic of Korea, with more than 40 per cent of electricity reliance on nuclear power but no sensitive facilities yet; and China, still at the very beginning of an ambitious programme. Collectively enhancing the transparency of facilities' operations in those three countries could promote peaceful nuclear development and non-proliferation. In the future, the possibility of establishing a joint inspectorate like EURATOM or ABACC (Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials) could be examined.

Another possibility could be to establish a regional operation of a nuclear facility. During the 1980s, a global evaluation of nuclear fuel cycles (INFCE) was conducted. One of the proposals that emerged was the concept of a regional fuel-cycle centre. If a sensitive facility, such as a reprocessing plant, could be operated not by one State but by a multinational body, transparency could be intensified and confidence built in and outside the region. The Republic of Korea, for example, has no definite plan for its accumulating spent fuel. In the future, China will require a reprocessing capability for civilian purposes. South-East Asia must begin to consider a way to dispose of its spent fuel once it establishes a commercial reactor economy. In my view, such a regional scheme may have a positive impact on Asian regional security.

It is not important whether such a regional system is called ASIATOM or PACIATOM; what is important is transparency. If Asia closes its doors to the outside world, suspicion will grow. An Asian system would need to invite its Pacific neighbours, including Australia, Canada and the United States, to participate.

Conclusions

Nuclear disarmament and non-proliferation in the post-Cold War Era require a rethinking of the regime that existed during the cold war. START I and II are welcome advances, but more pressure must be brought to bear on the NWS to further reduce their arsenals.

A long-term extension of the NPT is necessary and, in addition, the networking of regional frameworks could be examined. In order to increase transparency, and to further peaceful nuclear energy development and non-proliferation, Asian regional cooperation should be enhanced, perhaps in the form of ASIATOM.

COOPERATION IN THE FIELD OF NON-PROLIFERATION AND THE PEACEFUL USE OF NUCLEAR ENERGY

This being the 50th year of the nuclear bombing of Nagasaki and Hiroshima, the issue of cooperation in the field of non-proliferation and the peaceful use of nuclear energy has gained additional significance. It is a bit ironic, though, that 50 years down the road the subject is still being debated and that cooperation in non-proliferation and commercial nuclear power should remain contentious issues on the international agenda.

For example, during the discussions at the Seventh United Nations Regional Disarmament Meeting in Asia and the Pacific in Kathmandu, 13-15 February 1995, concerns were raised regarding Japan's civilian nuclear programme. Japan is a linchpin of the international non-proliferation regime. Its non-proliferation credentials are almost impeccable. Yet, there were lurking suspicions about its commercial nuclear power programme.

Another example is that of the Islamic Republic of Iran, also a charter member of the Nuclear Non-Proliferation Treaty but a country that the United States has officially stated should be denied any peaceful nuclear assistance, even under international safeguards.

Many other countries feel growing concern—driven by emphasis on non-proliferation—that an interest in commercial nuclear power can signal a potential interest in nuclear weapon capability. That is underscored by the Arab League's recent complaint that the supplier nations had imposed a selective embargo on the export of nuclear components and technology to its member States. I have heard questions raised about the intent of the Indonesian commercial nuclear power programme and why Malaysia and Viet Nam are having their nuclear scientists trained in India. There has to be a proper balance between non-proliferation concerns and the right of nations to meet their energy requirements through commercial nuclear power programmes.

Peaceful Nuclear Cooperation and the NPT

Cooperation in non-proliferation and in the peaceful applications of nuclear energy was the centre-piece of the bargain struck in 1968 between nuclear weapon and non-nuclear weapon States. Safeguards were devised to ensure that non-proliferation goals were not undermined by cooperation in the peaceful uses of nuclear energy. So why did the issue of peaceful nuclear energy cooperation dog the NPT review and extension debate? There are several reasons:

1. Since the bargain was struck in 1968, the non-proliferation and safeguards regime has been progressively tightened and reinforced in a way that has tilted the bargain in favour of the supplier nations and hindered cooperation in peaceful nuclear energy application. If recent years are any indication, no amount of tightening seems to satisfy the regime leaders.
2. The secret formation of a technology export control cartel, the Nuclear Suppliers Group, also known as the London Club, contravened the spirit, if not the letter, of the bargain struck in 1968. The cartel was formed in 1975, but it was not unveiled publicly until 1978. The lack of transparency in its operation remains an issue of concern. The cartel meets behind closed doors, and minimal information is released about its deliberations.
3. National and multilateral export control barriers to peaceful uses of nuclear energy have grown enormously since the mid-1970s:
   (a) The export controls first focused on controlling the spread of plutonium, viewed as the "root of the problem", as reflected in India's 1974 detonation of a nuclear device.
   (b) Then national and multinational controls prohibited the transfer of all technologies and components related to uranium enrichment and the separation of plutonium from irradiated fuel.
   (c) Then came even more sweeping restrictions on the form of controls on dual-use items and technologies.
   (d) Finally, there came lists of countries thought to be engaged in nuclear proliferation, with which all nuclear cooperation, including safety-related assistance, was proscribed, whether or not they were members of the NPT.

The growing emphasis on controlling dual-purpose technologies, particularly since the end of the war in the Persian Gulf, raises questions that go beyond the subject of peaceful nuclear energy cooperation and touch the core issues of civilian modernisation in the developing world.

Technological Cooperation and Technology Control

All technologies, particularly advanced technologies, have civil and military applications. The very technologies that are at the cutting edge of civilian modernisation are vital to military modernisation.

Examples are information technology, advanced composite materials, and biotechnology. Military innovations in the West rely increasingly on commercial technologies, so it is becoming very difficult to separate civil from military technology.

Admittedly, the proliferation of weapons of mass destruction cannot promote regional or global security. Nuclear weapons are a technology from the 1940s and within the reach of many nations. If we are to deter further proliferation and find ways to promote nuclear disarmament, there is a greater need today for cooperation between those who rely directly or indirectly on nuclear weapons for their security and the rest of the world.

The London Club, like other technology-control cartels, is made up largely of States within the present system of security alliances and umbrellas.

How should we promote cooperation in non-proliferation and peaceful nuclear energy?

1. Greater transparency in the functioning of the London Club is crucial.
2. The United Nations should supervise multilateral export barriers. Now, the non-proliferation regime is a mixed bag: an international treaty (the NPT), a safeguards agency affiliated with the United Nations (the IAEA), and the London Club, which has no international sanction. All the pillars of the regime should enjoy international legitimacy and support. It is unfortunate that even the institution that has international sanction (the IAEA) has come under attack from some analysts. If the effectiveness of the IAEA safeguards regime is questioned and is used to block peaceful nuclear cooperation or raise doubts about the peaceful intent of a nation's programme (such as Japan's), the future of the international non-proliferation regime will be seriously undermined.
3. Streamlining of national and multinational export controls is needed. A key question that arises is: should the protected area continue to be expanded through a growing web of technology controls, or should higher fences be built around a set of core technologies that are directly related to weapons of mass destruction? As I have said, proliferation is in no nation's interest. However, the future of non-proliferation depends on consensus-building, not on unilateral or cartel actions.

4. End-use controls should be accepted as an adequate protection against the diversion of nuclear materials and technology to weapons use. Such controls include on-site monitoring and challenge inspections. End-use controls are the answer, not technolog controls and technology denial. Technology control and denial are intended to impede cooperation rather than to promote it. At present, the suppliers insist on riding two horses simultaneously: end-use controls and technology control and denial.

Proliferation—A Political Problem

Proliferation is a political problem. Technical fixes by themselves cannot help to resolve political problems or even deal with them. A political problem needs international cooperation and support for settlement. Maintaining lists of proscribed items and proscribed countries runs counter to that objective. Technology control and denial policies, especially those that target an array of commercial technologies, also run counter to the objectives of developing an international free-trade regime. Developing countries are already raising the point that a free-trade regime should involve trade not only in goods and services, but also in the technological processes involved in manufacturing those goods and rendering those services.

The issue of a new, acceptable bargain between those countries which directly or indirectly rely on nuclear weapons for their security and the rest of the world resurfaced with the Review and Extension Conference of the NPT (17 April-12 May 1995). In order to achieve a favourable outcome, those relying on nuclear weapons for their security needed the support of a majority of States parties to the NPT. For that, they needed to strike an acceptable bargain with the majority. Nuclear weapons, I repeat, are within the reach of many nations. As United States President Harry Truman said after the first hydrogen-bomb test: “We must realise that no advantage we make is unattainable by others, that no advantage can be more than temporary”.

If a majority of countries with nuclear technological capability and economic resources have not developed nuclear weapons, it is because they see the possible advantages of nuclear arms as outweighed by political costs or as available through alliance with a nuclear weapon Power. However, perceptions of the value of an independent arsenal can change. Although the cold war has now ended, a new security order has yet to emerge. The current global political-military situation appears to be in a state of transition, with no clear indications of how a future world order will look. If the momentous developments of recent years indicate any trend, it is that perceptions and interests of nations and alliances can shift rapidly.

Build Consensus for Peaceful Cooperation

It is, therefore, doubly important that, in order to promote non-proliferation, we seek to work on consensus-building and cooperation in the peaceful uses of technology, not on technology control and denial. We need greater international legitimacy and support for institutions. Without an enduring bargain, the nuclear monopoly of the five would not survive for long and the NPT would unravel.

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EXISTING NUCLEAR WEAPONS: TECHNICAL DATA AND STATISTICS

A. INTRODUCTION

Nuclear weapons represent a historically new form of weaponry, which, by their multiple and far-reaching effects, provide a means of warfare whose mass destructive potential is unparalleled in human experience. Nuclear technology makes it possible to release more energy in one micro-second from a single nuclear weapon than all the energy released by conventional weapons used in all wars throughout history. In addition, nuclear weapons differ from conventional ones by the nature of their destructive effects, which comprise three elements: blast, heat and radiation. While the blast and heat are of an instantaneous nature, the radiation, which is peculiar to nuclear weapons, has both immediate and long-term effects. These effects have the potential to extend to areas beyond the borders of the target country.

The exact number of nuclear weapons in the world is difficult to estimate precisely. It seems that the current global total of nuclear warheads may be about 50,000, despite the elimination of some missile systems resulting from the 1987 INF Treaty between the United States and the Soviet Union. The, 1980 United Nations study on nuclear weapons placed the total at that time in excess of 40,000. This would imply a significant quantitative increase. However, there are numerous indications that the 1980 estimate was too low. Consequently, the current figure of 50,000 may actually represent a decrease in the number of warheads.

The individual explosive yield of currently deployed nuclear warheads is estimated to span the spectrum from 100 tons to more than 1 million tons equivalent of conventional high explosive. In the 1970s and early 1980s the trend was towards deploying nuclear warheads of smaller individual yields that had a greater accuracy in their delivery. Even with this trend the aggregate explosive power of present nuclear arsenals remains in the region of 13,000 million tons of TNT, or 1 million times the explosive energy of the Hiroshima atomic bomb.

There are five States that have officially acknowledged that they possess nuclear weapons: China, France, the Soviet Union, the United Kingdom and the United States. According to the figures given by the Stockholm International Peace Research Institute (SIPRI), the nuclear arsenals of the Soviet Union and the United States continue to contain more than 95 per cent of the total number of nuclear weapons in the world.

B. SHORT DESCRIPTION OF PHYSICAL PROPERTIES OF NUCLEAR WEAPONS

The essential part of a nuclear weapon is the nuclear explosive device or warhead. Warheads may be built into various kinds of missiles, gravity bombs, artillery shells and so on. The term "nuclear weapon" usually denotes both the nuclear warhead and the delivery vehicle that takes the warhead to the target, particularly when this vehicle is a missile. Over the years, both warheads and delivery vehicles have undergone significant processes of development and improvement. A "nuclear weapon system" may include specially designed platforms, from which weapons are launched, as well as supportive systems for command, control and so on.

1. Nuclear Warheads

There are two basic types of nuclear warheads: those based solely on fission (previously often called atomic weapons) and those which also utilise fusion (sometimes called thermonuclear or hydrogen weapons). The energy released in a nuclear explosion (yield) is usually measured in kilotons (kt) or megatons (Mt) corresponding to the energy released by a thousand or a million metric tons of the conventional explosive TNT (trinitrotoluene).

In a fission weapon, uranium or plutonium nuclei are split into lighter fragments—fission products. If there is more than a certain minimum amount of fissile material—the critical mass—a chain reaction can be initiated. Conventional high explosives are used to bring the critical mass together very quickly to enable it to explode with great force. For a plutonium bomb the fissile material may be put together to a size that may be no larger in volume than a human fist.

In a fusion weapon, the nuclei of heavy hydrogen isotopes—deuterium and tritium—are fused together at very high temperatures. The fusion process is triggered by a fission explosion. The fission device is indispensable as a triggering mechanism for thermonuclear explosions.

The energy released by a thermonuclear weapon (H-bomb) comes from both the fission "trigger" and the fusion materials. However, the amount of energy released per kilogram of nuclear explosive material can be several times as large from a fusion device as from a fission device. Extra fission energy can be added by surrounding the fusion weapons with a shell of uranium-238. The greater the proportion of fission energy released the "dirtier" the thermonuclear weapon becomes. It is called "dirty" because of the quantity of highly radioactive substances (e.g. strontium-90 and caesium-137) that are released into the atmosphere. "Cleaner" weapons have a much smaller release of these substances.

2. Characteristics of Nuclear Warhead Materials

All nuclear weapons contain at least a few kilograms of weapon grade plutonium or highly enriched uranium—the fissile material. Tritium is used in all thermonuclear warheads (hydrogen bombs). Tritium, like plutonium, does not occur in nature in extractable quantities and must be created in nuclear reactors. Plutonium decays with a half-life of about 24,000 years, which means it can be stored, whereas tritium has a half-life of 12 years, and therefore requires continuous production.

Natural uranium is composed of two main isotopes: 0.7 per cent is uranium-235, which is a fissile isotope, and 99.3 per cent is uranium-238, which requires high neutron energies to fission. In order to create nuclear weapons, the percentage of uranium-235 present in the uranium must be increased substantially. There are many ways to increase the percentage of uranium-235, the most common being gaseous diffusion.

The majority of nuclear weapons developed in the world today use plutonium-239 (produced by neutron irradiation of uranium-238), rather than uranium-235, as fissionable material. Plutonium-239 is easily split in a fission process. A production line for plutonium requires the capability to refine—but not necessarily to enrich—uranium, the fabrication of reactor fuel, a nuclear reactor and a chemical plant for plutonium extraction from the spent fuel elements (reprocessing).

3. Delivery Vehicles

The most important delivery vehicles for nuclear weapons are different types of rocket or jet-propelled missiles. There is, however, a variety of nuclear weapons that are designed to be delivered on targets by other means, e.g. gravity bombs, artillery shells, torpedoes and depth charges.

Missiles can be divided into different categories according to several criteria, such as by range, by means of propulsion, by basing mode or by notions of possible use. Long-range land-based and sea-based delivery vehicles are mainly ballistic missiles, while cruise missiles are important at somewhat shorter ranges. A ballistic missile is a pilotless rocket-propelled projectile. It consists of one or more fuel stages and the final stage, which is sometimes called the warhead. The term "ballistic" derives from the motion of the final stage, which is governed by inertia and gravity after separation from the rocket.

Long-range missiles of this kind through vertical trajectory are capable of reaching outer space and travelling long distances before re-entering the atmosphere and reaching the target; hence the term "re-entry vehicle" (RV). The final stage may contain several nuclear warheads, which are then to be regarded as separate re-entry vehicles. In this case, the final stage is often called the "bus". The final stage may also contain various penetration aids, such as decoys (devices that resemble nuclear warheads on radar screens and are designed to confuse defences against in-coming missiles).

Multiple RVs, which are released from the bus as soon as possible, follow separate ballistic trajectories for most of their flight paths. MRVs are not independently targeted but fall within a given diameter surrounding the target. Multiple independently targeted re-entry vehicles (MIRVs) can be independently aimed to impact upon different targets.

An important characteristic of ballistic missiles is the so-called throw-weight. This refers to the maximum weight of the useful load (warhead, guidance unit and penetration aids) that the missile is capable of carrying over its designated range. Thus, it serves to indicate what size of warhead, or what number of warheads of a certain size, the missile can accommodate. The ICBMs and submarine-launched ballistic missiles (SLBMs) now in service reportedly have throw-weights between about 700 and 7,500 kg.

Aerodynamic or cruise missiles, which are propelled by jet engines, sustain their flight through the use of aerodynamic lift over most of their flight path and travel through the atmosphere parallel to the ground like an aircraft (horizontal trajectory). The most modern cruise missiles can fly below 100 metres from the ground and at a speed of up to 800 kilometres per hour (km/h). They can be guided by remote control or by on-board navigation devices. The latter enable them to dodge obstacles in their path and make their detection by radar more difficult. They have a high level of accuracy.

Airborne nuclear weapon systems are various types of aircraft that can carry either nuclear bombs or missiles with nuclear warheads. An aircraft carrying gravity ("free fall") bombs may be thought of as a delivery vehicle, while it is more properly denoted a "platform" when carrying missiles.

Delivery vehicles have different ranges. The range is a maximum distance the vehicle can travel from the launching site to the target area. It is determined by the technical capabilities of the delivery vehicle in question. The operational range under particular conditions may be less than this, depending on which military function the weapon system is designated to perform.

C. CATEGORIES OF NUCLEAR WEAPONS

Nuclear weapons are assigned different military functions. There is, however, no international consensus on the way of denoting such military assignments or the corresponding weapons. In many cases, these assignments translate into technical requirements of the weapons system, with regard to such characteristics as yield, accuracy, range and means of delivery. For instance, the terms "strategic", "theatre" and "tactical" may have different connotations in different States. Some States do not accept these terms as a means of distinction between different types of nuclear weapons. Indeed, weapons called "tactical" by some might well be used in a way that is, in ordinary language, strategic as seen from the standpoint of the nation against which they are used.

The international literature mostly adheres to the categorisation used between the United States and the Soviet Union in the language of certain bilateral treaties in which differentiation between strategic, theatre and tactical missiles and aircraft is made by defining their appropriate ranges. This terminology has been used in the following sections.

Strategic nuclear weapons are generally aimed at an opponent's overall military and economic potential and have long-range or intercontinental capability. Theatre or tactical nuclear weapons may be used against selected military targets on or behind the immediate battlefield (airbases, supply depots, reserve forces) that are related to activities at the battlefield. Consequently, they operate at much shorter ranges than strategic weapons. Weapons envisaged for use against targets in the zone of direct combat are often called battlefield weapons. As a rule they have rather short-range capability or may even be stationary.

1. Strategic

Strategic nuclear forces consist of land-based intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs) and strategic bombers.

Most ICBMs are based in fixed, hardened installations- called silos. Others can be rail- or road-mobile. The ICBMs have an intercontinental range of up to 13,000 km. The flight time of an ICBM over its intercontinental range is about 30 minutes. According to official data, presently existing ICBMs carry from one to ten warheads, which may be independently targeted. ICBMs are highly accurate weapons, which is considered to make them suited for attacking hard "point" targets such as an adversary's missile silos.

One of the important characteristics of the SLBM force is that the system as a whole has greater invulnerability as long as the submarines are travelling undetected and are dispersed under the ocean surface. At present, no nation is known to have an anti-submarine capability that threatens this invulnerability. On the other hand, the submarines are widely considered to have a more tenuous communication link with the national command authority, particularly under wartime conditions. The SLBMs have generally been less accurate than land-based missiles and were primarily viewed as weapons to be used against larger and "softer" targets, such as military bases, airfields and possibly population centres. However, the advances in technology increasingly diminish the differences in accuracy between land-based and sea-based ballistic missiles. The SLBMs have a range of up to 12,000 km and may carry up to 14 warheads

The long-range strategic bombers can be used both for nuclear and non-nuclear missions. In contrast to the ballistic missiles they can also be retargeted en route or even recalled. This flexibility is considered a major advantage of the Strategic bomber force, while its disadvantages are its vulnerability and low speed, as compared with ICBMs. The strategic bombers combat range car. extend up to about 16,000 km and they can carry either gravity bombs or missiles.

Air-launched cruise missiles (ALCMs) can be fired from a "stand-off" position, i.e. outside the range of the opponent's air defences. If equipped with effective homing devices, air-launched missiles are considered to be effective against moving targets.

2. Tactical

This category of nuclear weapons can be deployed on land as well as at sea. The land-based forces include weapons such as ground mobile rockets and missiles, and air-launched bombs and missiles. Yields may vary from 1 kt or less to 1 Mt.

Tactical nuclear weapons deployed at sea are mounted on a variety of ships, submarines, naval aircraft and helicopters, and consist of bombs, surface-to-surface missiles (SSMs), surface-to-air missiles (SAMs) and anti-submarine warfare (ASW) rockets, torpedoes and depth charges.

Some of these systems with very short ranges might be denoted battlefield weapons. For use on a ground battlefield there are short range rockets and artillery shells.

In principle, artillery pieces of about 150 mm calibre or larger are nuclear-capable. Nuclear shells are generally believed to have yields from a fraction of a kiloton up to a few kilotons. The range of nuclear artillery is up to some tens of kilometres.

Atomic demolition munitions (ADMs), which are designed to be used on a battlefield, could create craters and other obstacles to an advancing enemy. These weapons do not appear to be currently deployed by nuclear weapon States.

D. NUCLEAR WEAPON ARSENALS

1. Strategic Arsenals

The composition and development of the strategic nuclear arsenals of the five nuclear weapon States reflect these countries' military postures, which are by no means identical. Nevertheless, with the exception of the United Kingdom, the common denominator between them is their reliance on the so-called triad arrangement—land-based, sea-based and bomber forces—but with different emphasis on one or the other leg of the triad. The military rationale for this arrangement lies in the differences of range, yield, accuracy, level of reliability, survivability and readiness between the various types of weapon systems.

A fair amount of information from governmental and academic sources is available on the strategic arsenals of the nuclear weapon States. As a result of various bilateral disarmament negotiations between the United States and the Soviet Union, much of the official data has been publicly disclosed regarding the overall strength and the general breakdown of strategic forces of these two States.

(a) United States of America

The United States considers a triad of nuclear delivery systems a basic prerequisite for the maintenance of its defence posture. Historically, however, the United States first concentrated on manned bombers as its main means of delivery for nuclear weapons. A substantial ICBM and SLBM capacity was developed in the early to mid-1960s.

Concerning the land-based forces, the United States has an estimated 1,000 ICBMs with 2,450 warheads. Some 450 ICBMs are the Minuteman-II, each with a single-warhead having a yield of 1-2 Mt. The remaining 500 ICBMs are Minuteman-III with three MIRV warheads, each of either 170 or 335 kt yield. Some of the older Minuteman-III have been replaced by MX missiles. So far, 50 MXs have been deployed in upgraded Minuteman. silos. The MX carries 10 MIRV warheads, each of up to about 500 kt, and has a range of over 11,000 km.

As regards the sea-based forces, the United States has 33 submarines (SSBNs) equipped with 592 SLBMs and about 5,100 warheads. Some 208 SLBMs are Poseidon missiles with an average of 10 MIRVs, each with a yield of 40 kt. The missile has a range of 4,600 km. The Poseidon missiles were once the mainstay of the United States sea-based nuclear deterrent force, but they are now gradually being replaced by Trident-I (C-4), which has a range of some 7,400 km and is estimated to carry 8 MIRVs of 100 kt each. The United States has already deployed 384 Trident-I SLBMs on Trident SSBNs and on Poseidon SSBNs. The United States also deploys strategic sea-launched cruise missiles (SLCMs). The Tomahawk land-attack missile with a nuclear warhead (TLAM/N) has an estimated range of approximately 2,500 km and has a 5-150 kt warhead. The Tomahawk, in either the strategic/nuclear or tactical/conventional role, is intended to be installed on a large number of naval vessels of all sizes.

The third part of the United States triad consists of approximately 350 strategic bombers with some 4,500 warheads. The bulk of/the force consists of B-52s. The other major component comprises some 97 Bl-B bombers.

(b) Soviet Union

The Soviet Union also maintains a triad of nuclear delivery systems, but it has long chosen to emphasise the ICBM arm of its strategic triad.

This was due partly to its pioneering ICBM technology and the lack of forward bases for bombers. The SLBMs were developed by the Soviet Union as a complementary, less vulnerable, retaliatory force against a possible first strike. By the 1970s, the Soviet sea-based nuclear forces had become an effective arm of the nuclear triad.

Currently, the Soviet Union deploys several ICBM systems, totalling 1,356 ICBMs, with approximately 6,450 warheads. Most of the missiles, i.e. some 1,100, were deployed in the period from 1966 to 1979 and consist of SS-11, SS-13, SS-17, SS-18 and SS-19. The last three carry multiple warheads. The SS-18 has a range of about 10,000 km and carries 10 warheads and the SS-19 has a range of 10,000 km with 6 warheads. The yield of both missiles is in the range of several hundred kilotons The remaining 220 ICBMs are more modern missiles. The SS-24 is a 10-warhead, rail-mobile ICBM and the SS-25 is a single-warhead road-mobile, ICBM. Both systems have ranges of over 10,000 km.

Concerning the sea-based forces, the Soviet Union has deployed 930 SLBM launchers of various types on SSBs and SSBNs with 3,642 warheads. Out of the total of 62 SSBNs, the Soviet Union maintains 12 Yankee-I class submarines in the Northern and Pacific fleets. They are armed with single warhead missiles. It also deploys the six largest SSBNs currently in service, the 30,000 ton Typhoon-class, each of which is armed with 20 SLBMs (SS-N-20). Only three types of the Soviet SLBMs have MIRVed warheads.

The Soviet Navy also has a sea-launched cruise missile (SS-N-21), comparable to the United States Tomahawk, which it first deployed in 1987. It is presently deployed on submarines.

Regarding bombers, the Soviet Union currently maintains 162 Bear and Blackjack strategic bombers. Some of the bombers are believed to have been recently fitted with cruise missiles. The new Soviet strategic bomber, the Blackjack, has a range similar to that of the United States Bl-B bomber.

(c) United Kingdom

The United Kingdom has never simultaneously deployed a nuclear triad, although at different times it has had in service bombers, land-based and sea-based ballistic missiles.

During the 1950s, the United Kingdom concentrated mostly on its bomber force. By 1963, it also operated 60 United States Thor land-based missiles, which gave the British the combined capability of reaching as many as 230 possible targets. At this time, the United Kingdom had two legs of a triad: land-based medium-range missiles and bombers.

In 1963, the United Kingdom acquired the technology from the United States to build 4 Polar is SSBNs, each equipped with 16 single warhead SLBMs. By 1970, it had abandoned the other two legs of the triad and since then has maintained a "one-dimensional" strategic force.

At present, these 4 British Polaris SSBNs are each equipped with 16 missiles, carrying two warheads (MRV). Thus, the United Kingdom has in its strategic force a total of 64 SLBMs with l28 warheads.

(d) France

France maintains a nuclear triad composed of bombers, land-based intermediate/medium-range ballistic missiles (IRBMs) and SLBMs. The French "force de dissuasion" (deterrent) is considerably smaller than that of either the United States or the Soviet Union.

The French nuclear bomber force consists of 20 Mirage IV with a combat radius of some 1,500 km. each with a payload of two 70 kt bombs or one 300 kt bomb. In recent years, some of these bombers have also been equipped with the ASMP short-range attack missile with a range of 100-300 km to give them a "stand-off" capability. These missiles are intended to improve the survivability and penetration ability of the aircraft's nuclear weapons. As regards the ballistic missiles, France deploys 18 IRBMs (S-3), each with one 1 Mt warhead. These have a range of 3,500 km.

The most important part of the French triad is its SLBMs, which presently consist of 6 SSBNs with a total of 256 warheads. Four of them are equipped with 16 SLBMs (M-20) each, which carry a single 1 Mt warhead and have a range of 3,000 km. Two submarines have been retrofitted with new SLBMs (M-4) with 6 MIRVed warheads and a range of 4,000-5,000 km.

(e) China

China has also adopted the triad approach to its nuclear force posture. Its strategic forces are the smallest of the five nuclear weapon States.

The oldest leg of its triad are the bombers. China deploys two types of manned bombers: the IL-28 and the TU-16. Their total number is believed to be between 120 and 150 aircraft, with a range of up to 1,850 km and 5,900 km, respectively. The IL-28 is capable of carrying one 20 kt-3 Mt bomb, and the TU-16 three 20 kt-3 Mt bombs.

The Chinese ground-based missile force consists of approximately 150 missiles, none of which have multiple warheads. Some of them are ICBMs with a range of 13,000 km.

With a successful test in September 1988, China has also developed an SLBM capability. It now deploys 2 submarines with 12 SLBMs (CSS-N-3) on them. The missile has a range of 3,300 km and carries one warhead with a yield of between 200 kt and 1 Mt.

2. Tactical and Battlefield Arsenals

(a) Land-Based

Following the 1987 INF Treaty between the United States and the Soviet Union, which provides for the elimination of land-based ballistic and cruise missiles of intermediate and shorter-range (5,000-500 km), only missiles of ranges less than 500 km remain in the tactical arsenals of these two nuclear weapon States. NATO countries (other than France) deploy 88 Lance missile launchers with warheads in the low-kiloton range in Europe. The Soviet Union deploys in Europe 1,608 short-range missile launchers, some of which have warheads in the high-kiloton range.

The nuclear warheads assigned to tactical and battlefield missions are kept in special storage sites on the territories of some of the United States allies in Europe and Asia. An academic source estimated the total number of United States nuclear warheads abroad assigned to land-based systems to be in the range of some 6,500 in 1985. Although the great majority of these were based in the Federal Republic of Germany and in the United Kingdom, smaller numbers were deployed in Italy, Turkey, Greece, South Korea, the Netherlands and Belgium. Following the reduction or replacement of part of the European stock of warheads (pursuant to earlier NATO decisions), another unofficial source put the number of United States tactical and battlefield warheads stored in Europe in 1988 in the range of 4,600.

Academic sources indicate that the Soviet Union keeps tactical nuclear weapons in the German Democratic Republic, Poland, Czechoslovakia and Hungary, presumably involving a “double-key” system of control and Soviet custodianship. As at 1989, over 1,000 Soviet tactical aircraft were forward-based at military facilities in the four countries. According to the Soviet Union, with the current withdrawal of its troops from Hungary and Czechoslovakia, Soviet nuclear weapons outside its territory will remain only in the German Democratic Republic and Poland until arrangements on tactical nuclear weapons in Europe make their presence there unnecessary.

Some of the United Kingdom's tactical and battlefield land-based nuclear weapons are deployed in the Federal Republic of Germany. France has a short range tactical nuclear force equipped with 44 Pluton ballistic missiles presumably with a 25 kt warhead and a range of about 120 km. France considers these to be pre-strategic rather than tactical weapons.

As regards land-based nuclear-capable aircraft, the United States forces in Europe deploy 65 medium-range bombers (FB-111A) and 300-400 forward-based strike aircraft (F-4, F-111 and others). The Soviet Union deploys 330 medium-range bombers (TU-22 Blinder and TU-22M Backfire), and also a large number of short-range strike aircraft.

Both the United States and the Soviet Union have developed artillery shells in the calibre range 152-240 mm and have deployed several hundreds of them in Europe. They are generally believed to have yields from a fraction of a kiloton up to a few kilotons.

Although the United States is known to have produced atomic demolition munitions (ADMs), no peacetime emplacement of ADMs is believed to have taken place. Furthermore, all of the existing munitions of this nature are to be completely withdrawn from the United States armed forces,

(b) Sea-Based

The United States and the Soviet Union have substantial numbers of tactical nuclear weapons deployed at sea.

The main tactical nuclear system of the United States are its several hundred aircraft stationed on 14 carriers, which form the core of the major naval task forces. Their range is between 550 and 1,800 km. Each aircraft can carry one or two bombs with yields that reportedly vary from 20 kt to 1 Mt.

For the purpose of anti-submarine warfare (ASW), the United States had deployed on most of the major classes of its surface vessels a number of nuclear-capable missiles with various ranges. While more detailed figures on these missiles are not available, in early 1989 reports were published to the effect that the United States Navy had decided to retire these nuclear systems, while retaining the option to introduce a new system. This retirement now seems to have taken place.

The United States Navy has nuclear-capable ASW aircraft and helicopters. The ASW aircraft may have a range of up to 3,800 km, and can carry one depth bomb, presumably of up to 20 kt yield. Their total number is not known.

The Soviet Union also deploys tactical nuclear weapons on board its fleet of vertical/short take-off and landing (V/STOL) aircraft-carriers and guided-missile cruisers.

Other Soviet surface vessels such as cruisers, destroyers and small craft are also equipped with a variety of surface-to-surface missiles (SSMs). Their range is estimated to be from 60 to 550 km and their warhead yields are in the medium kiloton range.

For the purpose of ASW, the Soviet Navy deploys several hundred ASW aircraft, each of which can carry one nuclear depth bomb. In addition to these aircraft, the Soviet Union also deploys several hundred ASW nuclear-tipped missiles.

E. SYSTEMS FOR COMMAND AND CONTROL OF NUCLEAR FORCES

1. General

To ensure that the political and military leaders of the nuclear weapon States have access to relevant and timely information and that they remain in communication with their nuclear forces and each other, it is necessary to have an elaborate system of reconnaissance, data-processing facilities and communication networks. The two major powers in particular have paid great attention to such systems. Some of their components are space-based sensors or communication links, others are ground-based and still others could be airborne. The totality of these assets, with their associated procedures and routines, is often referred to as "C^3I", which stands for command, control, communications and intelligence. In some cases, C^3I facilities have been hardened against nuclear attack to permit them to operate in a post-attack environment.

The sensors include early warning satellites intended to detect missile launches and big ground-based radar stations to follow the trajectories of the missiles. The communication links include relay satellites and ground-based radio links. Most of the command centres are located in well protected underground shelters, but there are also some airborne emergency command posts.

2. Release Procedure

As regards the United States, the President retains full authority over the use of nuclear weapons. If the President should become incapacitated, the Vice-President would assume responsibility.

The United States nuclear forces have an array of safeguards established to minimise the risk of unauthorised use. For tactical weapons a system called permissive action links (PALs) was established in the early 1960s. They use some kind of electronic locking system that guards against unauthorised use of the weapons. Some of these systems have the ability to disable or destroy a nuclear weapon in response to certain types of tampering. The control systems guard only the warhead not the launch system. They exist both on weapons in the United States and on United States warheads attached to NATO commands in Europe.

The United States Strategic Air Command has an additional mechanism, a bomber coded switch system, which requires a correct code to open the aircraft's bomb bay doors.

The United States ICBMs require two men to complete the procedure to launch. Since 1985, the command and control system for these missiles has become more robust. Every 10 missiles are controlled by a launch control centre (LCC), which passes on the unlock code. Until 1985, missile crews had physical control of the unlock codes, although they still operated under the "two-man" system. Now, all unlock codes are passed down from higher authorities.

The procedure on United States ships, particularly SSBNs, is somewhat different. There is no PAL system. However, a large number of officers must be involved in the firing process, once authorised. In the case of SSBNs, a firing message is received and confirmed by two separate teams of men. Special keys are issued to responsible crew members and a series of "permission" switches must be engaged in the correct order to fire a weapon. The entire crew is informed of each step of the procedure.

As in the United States, the exclusive responsibility for the use of all Soviet nuclear weapons is entrusted to the President of the Soviet Union as the Commander-in-Chief of the Soviet armed forces. In the event of the incapacitation of the Soviet President, his powers are transferred to the Chairman of the Supreme Soviet.

The decision for launch would be handed down from the President to the General Staff of the military. They would then communicate either to the Strategic Rocket Forces or directly to individual command posts. The only part of the Soviet military that is on a day-to-day alert are the strategic rocket forces and reportedly around 10 per cent of the SSBN force. Soviet ICBMs use a multiple-key system, similar to the one in use in the United States.

As is the case with United States nuclear forces in Europe, the Soviet Union retains sole control over its nuclear warheads assigned to the defence of Warsaw Treaty countries, whether those weapons are stationed in its own territory or on the territory of its allies.

The British nuclear command and control system in many ways parallels the procedure used in the United States. Only the Prime Minister can order the launch of the British nuclear weapons. Submarine captains also seem to have firing authority if the North Atlantic Council is silent for a predetermined period of time. The individual submarines have positive controls similar to American submarines, a two-man key system. Like the United States, the United Kingdom has no PALs on its SSBNs; rather, the message is read to the crew and two separate teams of officers confirm it. Keys are then issued by pre-launch officers to launching officers while all actions are read to the crew. The keys switch on "permission" links for launching.

As regards French nuclear forces, all control for launching resides with the President of the Republic. The Prime Minister is next in line of succession. Like the United Kingdom and United States, the French have a two-man system for nuclear weapons use, i.e. two individuals must receive two separate codes and engage them simultaneously.

Information on the Chinese C^3 I system is almost non-existent. To keep in touch with its SSBNs, China uses very low frequency (VLF) for world-wide communications, like other navies. No information is available on the Chinese ICBMs' command and control. It would seem reasonable that China has some kind of a PAL system for its nuclear systems. It is also presumed that the Chinese Government exercises as strict control over its military command system as is the case with other nuclear weapon States.

3. Handling of Nuclear Weapons

With a view to minimising the risk of nuclear weapons accidents, false alarms, unauthorised launches, terrorist attacks, theft, sabotage or seizure in countries where nuclear weapons are deployed, the nuclear weapon States have developed various safety measures for storing and handling of nuclear weapons.

There are a variety of technical devices on United States nuclear weapons to protect against unauthorised use, tampering and accidents (PALs, safing wires, insensitive high explosives, etc.); such devices are estimated to make the chance of an accidental nuclear explosion negligible. These precautions are also taken with United States nuclear weapons located in Europe. Nuclear weapons are stored in special "igloos", which have special protective measures, including automatic immobilisation devices for intruders.

The United States supplies almost all of the nuclear warheads assigned to NATO's defence. The custodial teams for the weapons are drawn from the United States military, who would release the weapons to authorised units, after authorisation for use was received. The United States controls internal security while the host nation controls site and transportation security. These United States custodial teams have the responsibility for control over United States nuclear weapons stored in host nations.

There are a number of controls on nuclear weapons at all nuclear storage sites, which are heavily guarded and hardened. Further, there are double barbed-wire fences with double locks and these are unlocked by two different people. There are many storage igloos at each site, some of which may possibly be decoys. Individual American soldiers who handle nuclear weapons have to complete the Personnel Reliability Programme and are broken up into two different types of access: "critical", which gives access to nuclear weapons for quality control, maintenance and inspections; and "controlled", which gives access to those with non-technical knowledge, or those involved in handling and assembly positions. Together, these two positions make up the two-man system and only United States citizens who have passed a rigorous security screening can occupy a "critical" position.

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LAND- AND SEA-BASED NUCLEAR WEAPONS

Weapon type	Number in service	Range (km)	Warhead load and yield	Warhead type	Number in the stockpile
1. UNITED STATES a/					
ICBMs					
Minuteman II	450	11300	1x1.2 Mt	W56	450
Minuteman III	200	13000	3x170 kt	W62	600
Kinuteman III (MK12A)	300	13000	3x335 kt	W78	900
MX	50/1000	11000	10x300 kt	W87	500/2450
SLBMS					
Poseidon	224	4600	10x40 kt	W68	2240
Trident I	384/608	7400	8x100 kt	W76	3072/5312
Bombers					
B-1B	97	9800	22 total either ALCM (200 kt each, 2,500 km) or bombs (828, 61, 83) or SRAM		1614
FB-111A	59	4700	6 SRAM (170 kt, 200 km) or 6 bombs (B43, 61, 83)		2484
B-S2G/H	193	16000	B-52G/H 20 SRAM or B-52G 12 ALCMs and 6 bombs; B-52H 12 ALCM externally mounted and 8 internally		1140
	349		mounted 5 238		

B-lBs and B-52s can carry a mix of 8 weapons mounted externally and 24 weapons in internal bomb racks. The FB-l1lA can carry 6 weapons, excluding ALCMs, B53 and B28. Individual bombs in the United States inventory can vary greatly *in* yield.

The B28 has 5 yields, 4 of which are known: 70 kt, 350 kt, 1.1 Mt and 1.45 Kt. The B43 has a 1 Mt yield. The B53 has a 9 Mt yield. The B57 has a sub 20 kt yield. The B61-0, -1, -7 have 4 yield options i*n t*he 100-500 kt range.

The B83 is said to have a yield of 1,000+ kt. The W69 Short-Range Attack Missile (SRAM) has a yield in the 170-200 kt range, and the W80-1 Air-Launched Cruise Missile (ALCM) has a 200-250 kt yield, b/

Land-based aircraft c/					
		2 250	1060-2400		1800
F-4 C/D/E			2,170 Ibs. max. 3xbombs (B28RE, B43, BS7, 361, B83 Genie)		
F-15 A/C			5 pylons 16,000 Ibs. max. (W2S, 833 *Ibs.* each or Genie 1.5 kt)		
F-16 A/B/C/D			possibly 5 nuclear weapons (B43, B57)		
F-111 A/D/E/F			3 bombs (B43, B57, B61, B83)		
Missiles					
Pershing II	111	190	1 x.3-80 kt	W85	125
GLCM	250	2500	1x. 2-150 kt	W84	325
Pershing IA	72	740	1 x 60-400 kt	W50	100
Lance	100	125	1 x 1-100 kt	W70	1 282
Nike Hercules	27	160	1 x 1-20 kt	W31	75 / 1907
Artillery					
155 mm and 203 mm	3850	30	1 x 1-12 kt		1 540
Atomic Demolition Munition (ADM)	150	—	1 x .01-1 kt	W54	150
Naval systems					
Carrier aircraft	1100 d/				
1450					
A-6E			3x B28 or B43 or B57 or B61, also Harpoon		
A-7E			4X (B28, E43, 57, 61)		
F/A-18A/B			2x (B61)		
Marine Corps					
A-4M			1x (B28, 43, 57, 61)		
AV-6B			Ix B61		
ASW systems					
AS ROC	?	1-10	1x5-10 kt	W44	574
SUBROC	?	60	1x5-10 kt	W55	285
ASW aircraft	710	1160-3 800	1x < 20 kt	B57	897

Aircraft include P-3A/B/C, S-3A/B, SH-3D/H. Some of the B57 nuclear depth bombs are allocated to British Nimrods, Italian Atlantics and Dutch P-3s.

Missiles					
Tomahawk (laud attack)	200	2500	1x5-150 kt	W80-0	200
Naval SAMs					
Terrier	?	35	1 x 1 kt	W45	290[e]
2. SOVIET ONION					
ICBMs					
SS-11 Mod 2		13000	1 x. 950-1.1 Mt		160
Mod 3	380	106003	x 100-350 kt (MRV)		630
SS-13 Mod 2	60	9400	1 x 600-750 kt		60
SS-17 Mod 2	110	10000	4 x 750 kt (MIRV)		480
SS-18 Mod 4	308	11000	10 x 550 kt (MIRV)		3080
SS-19 Hod 3	320	10000	6 x 500 kt (MIRV)		2100
SS-24	58	10000	10 x 100 kt (MIRV)		200
SS-25	$\frac{162}{1398}$	10500	1 x 550 kt		$\frac{150}{6860}$
SLBMS					
SS-N-6 Mod 3	240	3000	2 x. 375-1 Mt (MRV)		480
SS-N-8 Mod 1/2	286	7800	1 x 1-1.5 Mt		286
SS-N-17	12	3900	1 x.5-1 Mt		12
SS-N-18 Mod 1/3		6500	7 x 200-500 kt		
Mod 2	224	8000	1 x.45-1 Mt		1568
SS-N-20	100	8300	10 x 100 kt		1000
SS-N-23	$\frac{80}{942}$	7240	4 x100 kt		$\frac{256}{3602}$
Bombers					
Tu-95 A		8300	4 bombs	30	
Tu-95 B/C		8300	5 bombs or AS-3	100	
Tu-95 G		8300	4 bombs and 2 AS-4	270	
Tu-95 H	153	8300	8 AS-15 and 4 bombs	600	
TU—160 Blackjack	$\frac{9}{162^f}$	?	AS-15 and 4 bombs		$\frac{100}{1100}$
Anti-ballistic missiles					
ABM-1B (Galosh)	32	320	1x unknown		32
ABM-3	$\frac{68}{100}$	70	1xlow yield		$\frac{68}{100^g}$
Land-based systems					
Aircraft					
Tu-26	180	4 000	l-3xborabs or ASM		360
Tu-16	210	3 100	l-2xbombs or ASM		250
Tu-22	3302900-3 300		l-2xbombs or 1 ASM		120

Tactical aircraft	4050	700-1 300	l-2xbombs	3 230
Missiles				
SS-20	318	5 000	3x250 kt	1215
SS-4	18	2 000	1x1 Mt	65
SS-12	135	900	1x500 kt	405
SS-1c	620	280	1 x1-10 kt	1370
SS-23	239	500	1x100 kt	239
FROG7	658	70	1 x 1-25 kt	200
SS-21	289	120	1x10-100 kt	1100
SS-SHCH Scud b	601	?	?	?
SS-C-lb	100	450	1x50-200 kt	100
SAMS	7000	40-300	1 x low yield	4000
Artillery	6760	10-30	1 x low yield	2000
ADMs	?	?	?	?
Naval systems				
SS-N-S	36	1 400	1x1 Mt	36
Aircraft				
Tu-26	140	4 000	l-3 x bombs or ASM	280
Tu-16	170	3 100	l-2 x bombs or ASM	170
Tu-22	30 2	900-3 300	1 x bonbs	30
ASW aircraft	375	...	1x depth bombs	400

Nuclear-capable tactical aircraft include MiG-21 Fishbed L, MiG-23 Flogger B/G, MiG-27 Flogger D/J, Su-7B Fitter A, Su-17 Fitter C/D/H and Su-2 A/B/C/D/E.

ASW aircraft include Be-12 Mail, I1-38 May, Tu-142 Bear *P*, Ka-25 Hormone and KA-27 Helix helicopters.

Anti-shipping missiles				
SS-N-3	228	450	1x350 kt	120
SS-N-7	90	65	1x200 kt	44
SS-N-9	208	280	1x200 kt	78
SS-N-12	200	550	1x350 kt	76
SS-N-19	136	550	1x500 kt	56
SS-N-22	80	100	1x200 kt	24
Land attack				
SS-N-21	4	3000	1x200 kt	16
SS-NX-24	0	< 3000	1 x ?	0
ASW missiles/torpedoes				
SS-N-15		37	1 x low kt	?
SS-N-16	400	120	1 x10 kt	400
Fras-1	25	30	1 x 5 kt	25
Torpedoes type	65	16	1 x low kt	
ET-80	575	>16	1 x low kt	575

Naval SAMS					
SA-N-1	65	22	1 x 10 kt		
SA-N-3	43	37	1 x 10 kt		
SA-N-6	33	65	1 x kt		260 [h]
3. UNITED KINGDOM					
Aircraft					
Buccaneer S2B	25	1700	1x5-400/200 bomb	WE177	
Tornado GR-1	220	1300	1-2x400/200 kt	WE177	155-175
SLBMS					
Polar is A3-TK (Chevaline)	64	4 700	2x40 kt	MRV	128
Carrier aircraft					
Sea Harrier					
FRS 1	42	450	1x10 kt	WE177	42
ASW helicopters					
Sea King HAS 5	56	...	1x10 kt		
Lynx HAS 2/3	78	...	1x10 kt		25[i]
4 . FRANCE					
Aircraft					
Mirage 2000N/ASMP	15	1570	1 x 300 kt	TN81	15
Mirage IVp/ASMP	18	1500	1 x 300 kt (plus ASMP range of 80-250 km)	TN80	20
Jaguar A	45	750	1 x 6-8/30 kt bomb ant-52		50
Mirage IIIE	15	600	1x6-8/30 kt bomb ant-52		35
Land missiles					
S3D	18	3500	1 x 1 Mt	tn-61	18
Pluton	44	120	1 x 10/25 kt	ant-51	70
SLBMs					
M—20	64	3000	1x1 Mt	tn-61	64
M—4A	16	4000-5000	6x150 kt (MIRV)	tn-70	96
M—4B	16	6000	6x150 kt (MIRV)	tn-71	96
Carrier aircraft					
Super Etendard	36	650	1x6-8/30 kt bomb	ant-52	40 [j]
5. CHINA					
Aircraft					
B-5 (IL28)	15-30	1 850	1 x bomb (20 kt-3 Mt)		15-30
B-6 (Tu-16)	100	5900	l-3xbomb (20 kt-3 Mt)		100-130
Land missiles					
DF-2(CSS-1)	30-50	1450	1x20 kt		30-50
DF-3(CSS-2)	75-100	2600	1 x 1-3 Mt		75-100
DF-4(CSS-3)	~10	4800-7 000	1x 1-3 Mt		~10
DF-5(CSS-4)	~10	13000	1 x 4-5 Mt		~10

SLBMS				
CSS-N-3 (JL-1)	24	3300	1 x 200 kt-1 Mt	26-28 [k]

a. All data on United States strategic forces from *SIPRI Yearbook 1989,* p. 12.

b. Thomas B. Cochran et al., eds., *Nuclear Weapons Databook Vol. I: United States Nuclear Forces and Capabilities,* Cambridge, Ballinger, 1984, pp. 41-79. The variants also differ in the types of PALs.

c. The "numbers in service" refers to the total number of aircraft with nuclear capability in the United States arsenal. The range refers to the minimum and maximum range for this group of aircraft.

d. This number is the total number of nuclear-capable carrier aircraft in the United States Navy.

e. *SIPRI Yearbook 1989,* p. 13. Cochran *op. cit.*, United States Nuclear Forces, pp. 205-210, 213-223 and 232.

f. Data from Soviet official submission to the study and *SIPRI Yearbook 1989,* p. 14.

g. Data on Blackjack from institute for Defense and Disarmament Studies *(IDDS) Arms Control Reporter 1989,* Brookline, IDDS, 1989, p. 611. E.I. Other data from *SIPRI Yearbook 1989,* p. 15.

h. Data on theatre forces from *SIPRI Yearbook 1989,* pp. 16 and 17.

i. British data from *SIPRI Yearbook 1989,* p. 18.

j. *SIPRI Yearbook 1989,* p. 19.

k. *Ibid.,* p. 20.

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WEAPONS AND TECHNOLOGY

TABLE 1

US Strategic Nuclear Forces, January 1990

	Weapon system			*Warheads*		
Type	*No. deployed*	*Year deployed*	*Range (km)*	*Warhead x yield*	*Type*	*No. deployed*
ICBMs						
Minutcman II	450	1966	12 500	1 x 1.2 Mt	W56	450
Minuteman III (Mk 12)	200	1970	13000	3 x 170 kt	W62	600
Minuteman III (Mk 12A)	300	1979	13000	3 x 335 kt	W78	900
MX	50	1986	11000+	10 x 300 kt	W87	500
Total	**1000**					**2 450**
SLBMs						
Poseidon (13 SSBNs)	208	1971	4600	10 x 50 kt	W68	2 080
Trident I (20 SSBNs)	384	1979	7 400	8 x l00 kt	W76	3 072
Total	**592**					**5 152**
Bombers[a]						
B-1B	90	1986	9 800	ALCM]	W80-1	1600
B-52G/H	173	1958/61	16000	SRAM	W69	1 100
FB-111A	48	1969	4 700	Bombs	b	1 800
Total	**311**					**4 500**
Refuelling aircraft						
KC-135 A/R/E	615	1957	—	—	—	—
KC-10A	60	1981	—	—	—	—

a. Numbers reflect Primary Authorised Aircraft. An additional 7 B-lBs, 21 B-52s and 10 FB-111s are in the total inventory. B-52Gs at Andersen, AFB, Guam; Loring AFB, Maine; and Barksdale AFB, Louisiana, some 47 aircraft, have exclusively conventional missions. Bombers are loaded in a variety of ways, depending on mission. B-lBs normally carry up to 16 weapons (SRAMs and either B83 or B61 bombs). B-52s can carry a mix of 8-24 weapons. FB-111s can carry up to 6 weapons (SRAMs or B61 or B43 bombs).

b. Bomber weapons include four different nuclear bomb designs (B83. B61-0, -l,-7, B53, B43) with yields from low-kt to 9 Mt, ALCMs with selectable yields from 5 to 150 kt, and SRAMs with a yield of 170 kt.

Sources: Cochran,T.B Arkin, W. M. and Norris, R. S., *Nuclear Weapons Databook, Volume I: US Forces and Capabilities,* 2nd edn (Harper & Row: New York, forthcoming); authors' estimates.

TABLE 2

US Theatre Nuclear Forces, January 1990

	Weapon system			*Warheads*		
Type	*No. deployed*	*Year deployed*	*Range (km)*	*Warhead x yield*	*Type*	*No. stockpile*
Land-based systems						
Aircraft[a]	2 250	—	1 060-2 400	1-3 x bombs	Bombs[a]	1 800
Missiles						
Pershing II	70	1983	1 790	1 x 0.3-80 kt	W85	125[b]
GLCM	212	1983	2 500	1 x 0.2-150 kt	W84	325[b]
Pershing 1A	72	1962	740	1 x 60-400 kt	W50	100[c]
Lance	100	1972	125	1 x 1-100 kt	W70	1 282
Nike Hercules	0	1958	160	1 x 1-20 kt	W31	0[d]
Other systems						
Artillery[e]	4700	1956	30	1 x 0.1-12kt	[e]	1 540
ADM (special)	150	1964	—	1 x 0.01-1 ki	W54	150
Naval systems						
Carrier aircraft	1 100	—	550-1 800	1-2 x bombs	Bombs	1350
Tomahawk SLCM	300	1984	2 500	1 x 5-150kt	W80-0	300
ASW aircraft[g]	710	—	1 160-3800	1 x <20 kt	B57	850

a. Aircraft include the US Air Force F-4D/E, F-15E, F-16A/B/C/D and F-111A/D/E/F. Bombs include three types (B43, B57 and B61) with yields from sub-kt to 1.45 Mt.

b. Warheads will likely be placed in inactive reserve in the US stockpile.

c. Missiles are deployed with FRG forces. Warheads are in US custody.

d. The few remaining missiles deployed with the FRG will be retired in 1990.

e. Total inventory of US Army and Marine Corps nuclear-capable artillery. There are two types of nuclear artillery (155-mm and 203-mm) with four different warheads: a 0.1-kt W48,155-mm shell; a 1- to 12-kt W33,203-mm shell; a 0.8-kt W79-1, enhanced-radiation, 203-mm shell; and a variable-yield (up to 1.1 kt) W79-0 fission warhead. The enhanced-radiation warheads will be convened to standard fission weapons.

f. Aircraft include the US Navy A-6E, A-7E, F/A-18A/B and Marine Corps A-6E and AV-8B. Bombs include three types with yields from 20 kt to 1 ML

g. Aircraft include US Navy P-3A/B/C, S-3A/B and SH-3D/H helicopters. Some US B57 nuclear depth bombs are allocated for British Nimrod, Italian Atlantic and Netherlands P-3 aircraft

Sources: Cochran, T. B., Arkin, W. M. and Norris, R. S., *Nuclear Weapons Databook. Volume 1: US Forces and Capabilities.* 2nd edn (Harper & Row: New York, forthcoming); Collins, J. M. and Rennack, D. E., *US/Soviet Military Balance,* Library of Congress/Congressional Research Service, Report no. 89-4665, 8 Aug. 1989; International Institute for Strategic Studies, *The Military Balance 1989-1990* (IISS: London, 1989); authors' estimates.

TABLE 3

Soviet Strategic Nuclear Forces, January 1990

	Weapon system				*Warheads*	
Type	*NATO code-name*	*No. dep-loyed*	*Year dep-loyed*	*Range (km)*	*Warhead x yield*	*No. deployed*
ICBMs						
SS- 11 Mod. 2		150	1973	13000	1x 1.1 Mt	150
Mod. 3	Sego	210	1973	10600	3 x 350 kt (MRV)	210[a]
SS- 13 Mod. 2	Savage	60	1973	9 400	1 x 750 kt	60
SS-17Mod.2	Spanker	100	1979	10000	4 x 750 kt (MIRV)	400
SS- 18 Mod. 4/5	Satan	296/12	1979	11000	10 x 550/750 kt(MIRV)	3 080
SS-19 Mod. 3	Stiletto	300	1979	10000	6 x 550 kt (MIRV)	1 800
SS-24 Mod. 1/2	Scalpel	18/40	1987	10000	10 x 550 kt (MIRV)	580
SS-25	Sickle	170	1985	10500	1 x 550 kt	170
Total		**1356**				**6 450**
SLBMs						
SS-N-6 Mod. 3	Serb	192	1973	3000	2 x 1 Mt (MRV)	192[a]
SS-N-8 Mod. 1/2	Sawfly	286	1973	7 800	1x 1.5 Mt	286
SS-N-17	Snipe	12	1980	3 900	1 x 1 Mt	12
SS-N-18Mod. 1/3	Stingray	224	1978	6 500	7 x 500 kt	
Mod. 2			1978	8000	1 x 1 Mt	1 568
SS-N-20	Sturgeon	120	1983	8 300	10 x 200 kt	1 200
SS-N-23	Skiff	96	1986	8 300	4x 100 kt	384
Total		**930**				**3 642**
Bombers						
Tu-95	BearB/C	20	1962	12800	4 bombs or 1 AS-3	80
Tu-95	Bear G	45	1984	12800	4 bombs and 2 AS^4	270
Tu-95	BearH	80	1984	12 800	8 AS-15ALCMsor bombs	640
Tu-160	Blackjack	17	1988	14600	AS-15 ALCMs, 4 AS-16 SRAMs and 4 bombs	238
Total		**162**				**1 228**

Refuelling aircraft	—	140- 170	—	—	—	—
ABMs						
ABM-1B	Galosh Mod.	32	1986	320	1 x unknown	32
ABM-3	Gazelle	68	1985	70	1 x low yield	68
Total	**100**					**100**

a. SS-11 and SS-N-6 MRV warheads are counted as one.

Sources: Authors' estimates derived from: Cochran, T. B., Arkin, W. M., Norris, R. S. and Sands, J. I., *Nuclear Weapons Databook, Volume IV, Soviet Nuclear Weapons* (Harper & Row: New York, 1989); US Department of Defense, *Soviet Military Power,* lst-8th edns; DIA, *Force Structure Summary-USSR, Eastern Europe, Mongolia, and Afghanistan*, DDB-2680-170-89, Feb. 1989; Berman, R. P. and Baker, J. C., *Soviet Strategic Forces: Requirements and Responses* (Brookings Institution: Washington, DC, 1982); Con gressional Budget Office, *Trident II Missiles: Capability, Costs, and Alternatives,* July 1986; Collins, J. M. and Rennack, D. E., *U.S./Soviet Military Balance,* Library of Congress/Congressional Research Service, Report no. 88-466S, 8 Aug. 1989; Background briefing on *SMP, 1986,* 24 Mar. 1986; SASC/SAC, *Soviet Strategic Force Developments, Senate Hearing 99-335,* June 1985; Polmar, N., *Guide to the Soviet Navy,* 4th edn (US Naval Institute, Annapolis, Md., 1986); TASS news agency report, 15 Dec. 1989.

TABLE 4

Soviet Theatre Nuclear Forces, January 1990

	Weapon system				*Warheads*	
Type	*NATO code-name*	*No. deployed*	*Year deployed[a]*	*Range[b] (km)*	*Warhead x yield*	*No. deployed[a]*
Land-based systems						
Aircraft						
Tu-26	Backfire A/B/C	190	1974	4000	1 -3 x bombs or AS Ms	380
Tu-16	Badger A/G	200	1954	3100	1-2 x bombs or ASMs	200
Tu-22	Blinder A/B	75	1962	2400	1-2 x bombs or 1 ASM	75
Tactical aircraft[c]		2485	—	700-1300	1-2 x bombs	2500
Missiles						
SS-20	Saber	190	1977	5000	3 x 250 kt	570
SS-lc	Scud B	661	1965	300	1 x l-10kt	1370
—	FROG 3/5/7	370	1965	70	1 x 1-25 kt	1450
SS-21[d]	Scarab	289	1978	70	1x 10-100 kt	310
SSC-1b	Sepal	50	1962	450	1 x 50-200 kt	50
SAMs[e]	—	5900	1958-80	50-300	1 x lowkt	2400
Other systems						
Artillery[f]	—	6760	1973-80	10-30	1 x low kt	2000
ADMs	—	?	?	?	?	?

Naval systems						
Ballistic missiles						
SS-N-5	Sark	18	1963	1 400	1 x 1 Ml	18
Aircraft						
Tu-26	Backfire A/B/C	160	1974	4000	1-3 x bombs or ASMs	320
Tu-16	Badger A/C/G	135	1955	3100	4 x bombs or ASMs	540
Tu-22	Blinder A	20	1962	2400	4 x bombs	80
AS aircraft[g]	—	365	1966-82		1 x depth bombs	400
Anti-ship cruise missiles[h]						
SS-N-3 b/a,c	Shaddock/Sepal	228	1960	450	1x 350kt	120
SS-N-7	Starbright	64	1968	65	1 x 200 kt	32
SS-N-9	Siren	230	1969	280	1 x 200 kt	86
SS-N-12	Sandbox	216	1976	550	1x350kt	80
SS-N-19	Shipwreck	160	1980	550	1 x 500 kt	72
SS-N-22	Sunburn	120	1981	100	1 x 200 kt	40
Land-attack cruise missiles						
SS-N-21	Sampson	15	1987	3000	1 x 200 kt	90
ASW missiles and torpedoes						
SS-N-15	Starfish		1973	37	1 x l0 ktl	
SS-N-16	Stallion	375	1979	120	1 x l0 kt	375
FRAS-1	—	25	1967	30	1 x 5 kt	25
Torpedoes[i]	Type 651	1965	16		1 x low kt 1	475
	ET-80	475	1980	> 16	1 x low kt 1	
Naval SAMs						
SA-N-1	Goa	65	1961	22	1x l0 kt	220
SA-N-3	Goblet	43	1967	37	1 x lOkt	

a. For missile systems, the number is for operational or deployed missiles on launchers (see the Memorandum of Understanding of the INF Treaty, in *SIPRI Yearbook 1988,* appendix 13B).

b. Range for aircraft indicates combat radius, without refuelling.

c. Nuclear-capable tactical aircraft models include 130 MiG-21 bis Fishbed L, 855 MiG-27 Flogger D/J, 750 Su-17 Fitter C/D/H, and 750 Su-24 Fencer A/B/C/D/E. New estimate reflects distinction between ground attack and counter-air; see DIA, *Force Structure,* p. 18.

d. Includes SS-21s in GDR and Czechoslovak units.

e. Nuclear-capable land-based surface-to-air missiles probably include SA-2 Guideline, SA-5 Gammon and SA-10 Grumble.

f. Nuclear-capable artillery include systems of the three calibres: 152-mm (D-20, M-1976, 2S3 and 2S5), 203-mm (M55, 2S7 and M-1980) and 240-mm (2S4 and M-240). Some older systems may also be nuclear-capable.

g Includes 90 Be-12 Mail, 45 11-38 May and 60 Tu-142 Bear F patrol aircraft. Land- and sea-based helicopters include 95 Ka-25 Hormone and 75 Ka-27 Helix models.

h Number deployed is total launchers on nuclear-capable ships and submarines. Warheads based on an average of 2 nuclear-armed cruise missiles per nuclear-capable surface ship, except for 4 per Kiev and Kirov Class ships, and 4 per nuclear-capable cruise missile submarine, except for 12 on the Oscar Class.

i. The two types of torpedo are the older and newer models, respectively, with the ET-80 probably replacing the Type 65.

Sources: Cochran, T. B., Arkin, W. M., Norris, R. S. and Sands, J. I., *Nuclear Weapons Databook, Volume IV, Soviet Nuclear Weapons* (Harper & Row: New York, 1989); Polmar, N., *Guide to the Soviet Navy,* 4th edn (US Naval Institute: Annapolis, Md., 1986); Department of Defense, *Soviet Military Power,* lst-8th edns; DIA, *Force Structure Summary-USSR, Eastern Europe, Mongolia, and Afghanistan,* DDB-2680-170-89, Feb. 1989; Collins, J. M. and Rennack, D. E., *US/Soviet Military Balance,* Library of Congress/Congressional Research Service, Report No. 89-4665, 8 Aug. 1989; IISS, *The Military Balance 1989-1990* (Brassey's: London, 1989); NATO, *Conventional Forces in Europe: The Facts,* 25 Nov. 1988; interviews with US DOD officials, Apr. and Oct. 1986; Handler, J. and Arkin, W. M., *Nuclear Warships and Naval Nuclear Weapons: A Complete Inventory,* Neptune Paper no. 2 (Greenpeacc/Institute for Policy Studies: Washington, DC, 1988).

TABLE 5

British Nuclear Forces, January 1990[a]

	Weapon system				*Warheads*	
Type	*No. deployed*	*Year deployed*	*Range (km)[k]*	*Warhead x yield*	*Type*	*No. in stockpile*
Aircraft						
Tornado GR-1	220	1982	1300	1-2 x 400/200 kt bombs[c]	WE-177A/B	
Buccaneer S2B	25	1962	1700	1 x 400/200 kt bomb	WE-177A/B	155-175[d]
SLBMs						
Polaris A3-TK	64	1982[e]	4700	2 x 40 kt	MRV	96[f]
Carrier aircraft						
Sea Harrier FRS.1[g]	42	1980	450	1 x 10 kt bomb	WE-177C	
ASW helicopters						
Sea King HAS 5	56	1976	—	1 x 10 kt depth bomb	WE-177C.	25[h]
Lynx HAS 2/3	78	1976	—	1 x l0 kt depth bomb	WE-177C	

a. British systems certified to use US nuclear weapons include 31 Nimrod ASW aircraft based in the UK, and 20 Lance launchers (1 regiment of 12 launchers, plus spares) and 135 artillery guns in 5 regiments (120 M109 and 15 M l10 howitzers) based in FR Germany.

b. Range for aircraft indicates combat radius, without refuelling.

c. The US Defense Intelligence Agency (DIA) has confirmed that the RAF Tornados 'use two types of nuclear weapons, however, exact types are unknown'. The DIA further concludes that each RAF Tornado is capable of carrying 2 nuclear bombs, on the 2 outboard fuselage stations.

d. The total stockpile of WE-177 tactical nuclear gravity bombs is about 180-200, of which 155-75 are versions A and B. All three weapons use the same basic 'physics package', and the yield is varied by using different amounts of tritium.

e. The two-warhead Polaris A3-TK (Chevalinc) was first deployed in 1982 and has now completely replaced the original three-warhead Polaris A-3 missile (first deployed in 1968).

f. In previous *SIPRI Yearbook;* the British strategic stockpile was estimated at 128 warheads: 64 two-warhead Polaris A3-TK SLBMs on four SSBNs. It is now thought that Britain produced only enough warheads for three full boat-loads of missiles, or 48 missiles, with a total of 96 warheads. In Mar. 1987 French President Mitterrand confirmed that Britain had ’90 to 100 [strategic] warheads’.

g The US DIA has concluded that the Sea Harrier is not nuclear-capable, even though every British Defence While Paper since 1981 states that it is.

h The C version of the WE-177 bomb is believed to be assigned to selected Royal Navy (RN) Sea Harrier FRS.l aircraft and ASW helicopters. The WE-I77C exists in both a free-fall and depth bomb modification, by varying the fuzing and easing options. There are an estimated 25 WE-177Cs, each with a yield of approximately 10 kt (possible variable yield).

Sources: British Ministry of Defence, *Statement on the Defence Estimates,* 1980-89 (Her Majesty’s Stationery Office: London, annual); Campbell, D., Too few bombs to go round, *New Statesman,* 29 Nov. 1985, pp. 10-12; Nott, J, ‘Decisions to modernise UK’s nuclear contribution to NATO strengthen deterrence’, *NATO Review,* vol. 29, no. 2 (Apr. 1981); US Defense Intelligence Agency, various reports released under the Freedom of Information Act; Urban, M., *The Independent:* including Urban, M., ‘Outdated nuclear bomb’s credibility in question’, *The Independent,* 16 May 1988, p. 5; Urban, M., ‘Clarification’, *The Independent,* 17 May 1988. Additional sources: Francois Mitterrand, French President, an interview translated by the Service de Presse et d’Information of the French Embassy, London, 29 Mar. 1987, p. 6.

TABLE 6

French Nuclear Forces, January

	Weapon system				*Warheads*	
Type	*No. deployed*	*Year deployed*	*Range (km)*[a]	*Warhead x yield*	*Type*	*No. in stockpile*
Aircraft						
Mirage IVP/ASMP	18	1986	1 500	1 x 300 kt	TN 80	18
Mirage 2000N/ASMP[b]	42	1988	1 570	1 x 300 kt	TN-81	24
Jaguar A	45	1974[c]	750	1 x 6-8/25 kt bomb[e]	AN-52[d]	45
Refuelling aircraft						
C-135/FR	11	1965	—	—	—	—
Land-based missiles						
S3D	18	1980	3 500	1 x 1 Mt	TN-61	18
Pluton	44	1974	120	1 x 10/25 kt	AN-51[e]	70

Submarine-based missiles						
M-20	48	1977	3000	1 x 1 Mt	TN-61	48
M-4A	16	1985	4 000-5 000	6 x 150 kt (MIRV)	TN-70	96
M-4B	32	1987	6000	6x 150 kt (MIRV)	TN-7I	192
Carrier-based aircraft						
Super Etendard/ASMP[g]						
M-20	36	1978[c]	650	1 x 6-8/25 kt bomb or or 1 x 300 kt ASMP	AN-52[e]	24

a. Range for aircraft indicates combat radius, without refuelling, and does not include the 90- to 350-km range of the ASMP air-to-surface missile (where applicable).

b. The Mirage 2000/ASMP has completely replaced the Mirage III E in the tactical nuclear role and will replace one Jaguar A squadron (15 aircraft) in July 1990. 75 Mirage 2000N aircraft are planned.

c. The Jaguar A and Super Etendard aircraft were first deployed in 1973 and 1978, respectively, although they did not carry nuclear weapons (the AN-52) until 1974 and 1981, respectively.

d. Two-thirds of the AN-52 stockpile reportedly consists of the low-yield variant, and one-third the high-yield variant. The AN-52 has an estimated weight of 455 kg, length of 4.2 m, diameter of 0.6 m and span of 0.8 m.

e. The same nuclear device is used for both the AN-52 warhead (gravity bomb) and the AN-51 warhead (Pluton). Both warheads have the same higher yield of 25 kt (thus said to have the MR-50 charge in common), yet have lower yields of 6-8 kt and 10 kt, respectively.

f. The *Inflexible* was the only SSBN to receive the TN-70. All subsequent refits of the M-4 into Redoutable Class SSBNs will incorporate the improved TN-71 warhead.

g. The Super Etendard can carry either 1 AN-52 bomb or 1 ASMP missile. At full strength the AN-52 equipped 2 squadrons (24 aircraft) of Super Etendard: flottilles 11F and 17F, based at Landivisiau and Hyeres, respectively. From mid-1989 these two squadrons began receiving the ASMP missile by mid-1990, all 20 aircraft (to be configured to carry the ASMP) will be operational. Although originally about 50-55 Super Etendard aircraft were to receive the ASMP, because of budgetary countraints the number of aircraft so configured dropped to 20.

Sources: Commissariat a I'Energie Atomique (CEA), 'Informations non classifiees sur I'armement nucleaire francais', 26 June 1986; US Defense Intelligence Agency (DIA), *A Guide to Foreign Tactical Nuclear Weapon Systems under the Control of Ground Force Commanders,* DST-1040S-541-83, 9 Sep. 1983, with CHG 1 and 2 (secret, partially declassified), 17 Aug. 1984 and 9 Aug. 1985; Boucheron, J. M., *L'Equipement Militaire pour les Annees 1990-1993* (Assemblee Nationale: Paris, 1989); Prime Minister, *L Organisation de la Defense de la France,* no. 15 (Nov. 1985), p. 32.

TABLE 7

Chinese Nuclear Forces, January 1990

	Weapon system			*Warheads*	
Type	*No. deployed*	*Year deployed*	*Range (km)*	*Warhead x yield*	*No. in stockpile*
Aircraft[a]					
H-5 (I1-28 Beagle)	20	1974	1 850	1 x bomb[b]	20
H-6(Tu- 16 Badger)	120	1965	5 900	1-3 x bombs	130
Land-based missiles					
DF-2(CSS-1)	20-30	1966	1 450	1 x 20 kt	20-30
DF-3 (CSS-2)	60-80	1970	2600	1 x 1-3 Mt	60-80
DF-4 (CSS-3)	-10	1971	4 800-7 000	1 x 1-3 Ml	10
DF-5 (CSS-4)	-10	1979	13000	1 x 4-5 Mt	10
M9/SST 600	—	1989	600	1 x low kt	—
Submarine-based missiles[c]					
JL-1 (CSS-N-3)	24	1986	3 300	1 x 200 kt-1 Mt	26-38

a. All figures for these bomber aircraft refer to nuclear-configured versions only, Hundreds of these aircraft are also deployed in non-nuclear versions.

b. Yields of bombs are estimated to range from below 20 kt to 3 Mt.

c. Two missiles are presumed to be available for rapid deployment on the Golf Class submarine (SSB) Additional missiles are being built for new Xia Class submarines.

Sources: *SIPRI Yearbook 1989;* Defense Intelligence Agency, *Handbook of the Chinese People's Liberation Army,* DDB-2680-32-84, Nov. 1984; Defence Intelligence Agency, 'A guide to foreign tactical nuclear weapon systems under the control of ground force commanders', DST-1040S-541, 4 Sep. 1987; Lewis, J. W. and Xue, L., *China Builds the Bomb* (Stanford University Press: Stanford, Calif., 1988); Jencks, H. W., 'PRC nuclear and space programs', in ed. R. Yang, *SCPS Yearbook on PLA Affairs, 1987* (Sun Yat-sen Center for Policy Studies: Kaohsiung, Taiwan, 1988), chapter 8; author's estimates.

TABLE 8

Strategic Nuclear Weapon Arsenals of the USA, the USSR, the UK, France and China, 1946-89

	USA		*USSR*		*UK*		*France*		*China*	
Year[a]	*L*	*W*	*L*	*W*	*L*	*W*	*L*	*W*	*L*	*W*
1946	125	9	—	—	—	—	—	—	—	—
1947	270	13	—	—	—	—	—	—	—	—
1948	473	50	—	—	—	—	—	—	—	—

1949	447	200	—	—	—	—	—	—	—	—
1950	462	400	—	—	—	—	—	—	—	—
1951	569	569	—	—	—	—	—	—	—	—
1952	660	660	—	—	—	—	—	—	—	—
1953	720	878	—	—	—	—	—	—	—	—
1954	1035	1418	—	—	—	—	—	—	—	—
1955	1260	1755	—	—	8	—	—	—	—	—
1956	1470	2123	22	84	48	—	—	—	—	—
1957	1605	2460	28	102	73	—	—	—	—	—
1958	1620	2610	56	186	88	40	—	—	—	—
1959	1551	2496	108	283	96	70	—	—	—	—
1960	1559	3127	138	354	120	105	—	—	—	—
1961	1532	3110	187	423	120	163	—	—	—	—
1962	1653	3267	235	481	144	180	—	—	—	—
1963	1812	3612	302	589	144	207	—	—	—	—
1964	2012	4180	425	771	128	204	4	4	1	—
1965	1888	4251	463	829	88	199	32	32	2	2
1966	2139	4607	570	954	88	194	36	36	20	10
1967	2268	4892	947	1349	88	189	36	36	25	20
1968	2191	4839	1206	1605	80	232	36	36	33	30
1969	2109	4736	1431	1815	48	144	36	36	48	45
1970	2100	4960	1835	2216	64	144	36	36	73	75
1971	2087	6064	2075	2441	64	144	45	45	97	102
1972	2167	7601	2207	2573	64	144	70	70	113	118
1973	2133	8885	2339	2711	64	144	86	86	130	125
1974	2106	9324	2423	2795	64	144	86	86	150	140
1975	2106	9828	2515	3217	64	144	102	102	165	155
1976	2092	10436	2545	3477	64	144	98	98	176	170
1977	2092	10580	2562	4242	64	144	114	114	186	176
1978	2086	10832	2557	5516	64	144	114	114	211	201
1979	2086	10800	2548	6571	64	144	114	114	238	230
1980	2022	10608	2545	7480	64	144	130	130	255	250
1981	1966	10688	2593	8296	64	144	130	130	262	262
1982	1921	10515	2545	8904	64	128	130	130	267	272
1983	1905	10802	2543	9300	64	112	126	126	279	284
1984	1943	11500	2540	9626	64	112	126	126	286	296
1985	1965	11974	2538	10012	64	96	142	222	298	308

1986	1957	12386	2506	10108	64	96	138	218	295	300
1987	2001	13002	2535	10442	64	96	138	298	280	290
1988	1926	13000	2553	10834	64	96	132	292	282	292
1989	1903	12100	2448	11320	64	96	132	372	274	284

L: Launchers; W: Warheads

a. Figures are given as at the end of each year.

Sources: Coshran, T.B., Arkin, W. M. and Norris, R.S., *Nuclear Weapons Databook, Volume I,* forthcoming (for the USA), *Volume IV*. 1989 (for the USSR) and *Volume V*, forthcoming (for the UK, France and China).

APPENDIX

NUCLEAR EXPLOSIONS, 1945-89

TABLE A.1

Registered Nuclear Explosions in 1989

Date	*Date (GMT)*	*Origin time (deg)*	*Latitude (deg)*	*Longitude Region*	*Body wave magnitude[a]*
USA					
10 Feb.	200600.0	37.077 N	116.001 W	Nevada	5.4
24 Feb.	161500.0	37.128 N	116.122 W	Nevada	
9 Mar.	140500.0	37.143 N	1 16.067 W	Nevada	5.1
15 May	131000.0	37.108 N	116. 121 W	Nevada	4.6
26 May	180700.0	37.086 N	1 16.055 W	Nevada	
22 June	211500.8	37.283 N	1 16.412 W	Nevada	5.4
27 June	153102	37. N	116. W	Nevada	5.3
14 Sep.	150000.1	37.236 N	116. 163 W	Nevada	
31 Oct.	153000.0	37. N	116. W	Nevada	5.6
15 Nov.	202000.1	37.107	116.013 W	Nevada	
20 Dec.					
Nevada					
USSR					
22 Jan.	035706.6	49.924 N	78.831 E	E. Kazakhstan	
12 Feb.	041506.8	49.925 N	78.740 E	E. Kazakhstan	7.0
17 Feb.	040106.9	49.868 N	78.079 E	E. Kazakhstan	5.1
8 July	034657.6	49.873 N	78.815 E	E. Kazakhstan	6.8
2 Sep.	041702.0	50.023 N	79.045 E	E. Kazakhstan	5.8
4 Oct.	113006.0	50. N	78. E	E. Kazakhstan	5.2
19 Oct.	094957.0	49.928 N	79 .016 E	E. Kazakhstan	6.8
UK					
8 Dec.	150002.0			Nevada	5.7

France					
11 May	164458.1	21.881 S	138.978 W	Mururoa	5.6
20 May	175900	21. S	139. W	Mururoa	4.5
3 June	172958.4	21.832 S	139.010 W	Mururoa	5.0
10 June	172958.1	22.252 S	138. 740 W	Fangataufa	5.5
24 Oct.	162957	21. S	139. W	Mururoa	5.4
31 Oct.	165700	21. S	139. W	Mururoa	5.2
20 Nov.	172900			Mururoa	5.3
27 Nov.	170000			Fangataufa	5.6

a. Body wave magnitude *(mb,)* indicates the size of the event, *mb* data for the US, Soviet and British tests were provided by the Hagfors Observatory of the Swedish National Defence Research Institute (FOA) and data for the French tests by the Australian Seismological Centre, Bureau of Mineral Resources, Canberra.

TABLE A.2

Estimated Number of Nuclear Explosions 16 July 1945-5 August 1963 (The Signing of the Partial Test Ban Treaty)

a = atmospheric
u = underground

	USA		*USSR*		*UK*		*France*		
Year	*a*	*u*	*a*	*u*	*a*	*u*	*a*	*u*	*Total*
1945	3	0							3
1946	2[a]	0							2
1947	0	0							0
1948	3	0							3
1949	0	0	1	0					1
1950	0	0	0	0					0
1951	15	1	2	0					18
1952	10	0	0	0	1	0			11
1953	11	0	4	0	2	0			17
1954	6	0	7	0	0	0			13
1955	17[a]	1	5[a]	0	0	0			23
1956	18	0	9	0	6	0			33
1957	27	5	15[a]	0	7	0			54
1958	62[b]	15	29	0	5	0			111
1949-58, exact years unknown		18							18

1959	0	0	0	0	0	0			0
1960	0	0	0	0	0	0	3	0	3
1961	0	10	50[a]	1	0	0	1	1	63
1962	39[a]	57	43	1	0	2	0	1	143
1 Jan.-5 Aug. 1963	4	25	0	0	0	0	0	2	31
Total	**217**	**114**	**183[c]**	**2**	**21**	**2**	**4**	**4**	**547**

a. One of these tests was carried out under water.

b. Two of these tests were carried out under water.

c. The total figure for Soviet atmospheric tests includes the 18 additional tests conducted in the period 1949-58, for which exact years are not available.

TABLE A.3

Estimated Number of Nuclear Explosions 6 August 1963-31 December 1989

a = atmospheric

u = underground

	USA[a]		*USSR*		*UK*[a]		*France*		*China*		*India*		
Year	*a*	*u*	*a*	*u*	*a*	*u*	*a*	*u*	*a*	*u*	*a*	*u*	*Total*
6 Aug.-31 Dec. 1963	0	15	0	0	0	0	0	1					16
1964	0	38	0	6	0	1	0	3	1	0			49
1965	0	36	0	9	0	1	0	4	1	0			51
1966	0	43	0	15	0	0	5[b]	1	3	0			67
1967	0	34	0	17	0	0	3	0	2	0			56
1968	0	45[c]	0	13	0	0	5	0	1	0			64
1969	0	38	0	16	0	0	0	0	1	1			56
1970	0	35	0	17	0	0	8	0	1	0			61
1971	0	17	0	19	0	0	5[b]	0	1	0			42
1972	0	18	0	22	0	0	3	0	2	0			45
1973	0	16[d]	0	14	0	0	5	0	1	0			36
1974	0	14	0	18	0	1	7[b]	0	1	0	0	1	42
1975	0	20	0	15	0	0	0	2	0	1	0	0	38
1976	0	18	0	17	0	1	0	4	3	1	0	0	44
1977	0	19	0	18	0	0	0	8	1	0	0	0	46
1978	0	17	0	27	0	2	0	8	2	1	0	0	57
1979	0	15	0	29	0	1	0	9	1	0	0	0	55
1980	0	14	0	21	0	3	0	13	1	0	0	0	52
1981	0	16	0	22	0	1	0	12	0	0	0	0	51
1982	0	18	0	31	0	1	0	6	0	1	0	0	57

1983	0	17	0	27	0	1	0	9	0	2	0	0	56
1984	0	17	0	29	0	2	0	8	0	2	0	0	58
1985	0	17	0	9	0	1	0	8	0	0	0	0	35
1986	0	14	0	0	0	1	0	8	0	0	0	0	23
1987	0	14	0	23	0	1	0	8	0	1	0	0	47
1988	0	14	0	17	0	0	0	8	0	1	0	0	40
1989	0	11	0	7	0	1	0	8	0	0	0	0	27
Total	0	590	0	458	0	19	41	128	23	11	0	1	1271

a. See note *a* below.
b. One more test was conducted this year, but it did not cause any detonation.
c. Five devices used simultaneously in the same test are counted here as one explosion.
d. Three devices used simultaneously in the same test are counted here as one explosion.
e. Two of these tests may have been conducted in 1975 or 1976.
f. This explosion may have been conducted underground.

TABLE A.4

Estimated Number of Nuclear Explosions 16 July 1945-31 Dec. 1989

USA[a]	*USSR*	*UK*[a]	*France*	*China*	*India*	*Total*
921	643	42	177	34	1	1818

a. All British tests from 1962 have been conducted jointly with the United States at the Nevada Test Site. Therefore, the number of US tests is actually higher than indicated here.

Sources for tables A.1-A.4

Swedish National Defence Research Institute (FOA), various estimates; Norris, R. S., Cochran, T. B. and Arkin. W. M., 'Known US nuclear tests July 1945 to 31 December 1988', *Nuclear Weapons Databook,* Working Paper no. 86-2 (Rev. 2C) (Natural Resources Defense Council: Washington, DC, Jan. 1989); Australian Seismological Centre, Bureau of Mineral Resources, Geology and Geophysics, Canberra; Cochran, T. B., Arkin, W. M., Norris, R. S. and Sands, J. I., *Nuclear Weapons Databook, Vol. IV, Soviet Nuclear Weapons* (Harper & Row: New York, 1989), chapter 10; Burrows, A. S., Norris, R. S., Arkin, W. M. and Cochran, T. B., 'French nuclear testing, 1960-88 , *Nuclear Weapons Databook,* Working Paper no. 89-1 (NRDC: Washington, DC, Feb. 1989); 'Known Chinese nuclear tests, 1964-1988', *Bulletin of the Atomic Scientists* (Oct. 1989), p. 48 (see also Nov., p. 52); and various estimates.

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TRENDS IN THE TECHNOLOGICAL DEVELOPMENT OF NUCLEAR WEAPON SYSTEMS

A. General

Nuclear weapons have undergone tremendous change and development since their inception some 45 years ago. Apart from the basic principle of nuclear reactions as the source of energy, there remains very little resemblance between the first two bombs exploded at Hiroshima and Nagasaki, which were technically very primitive, and the ballistic missiles equipped with a number of multiple independently targetable re-entry vehicles (MIRVs) in the nuclear weapon arsenals today.

While there is no doubt that this sophistication of nuclear weapons has been made possible by the application of modern science and technology, the role of science and technology in nuclear weapon developments has been interpreted in different ways. Thus, there are those who see the ongoing technological development of nuclear weapons as being necessitated by threats to national security and as a corollary to the evolution of theories or doctrines regarding the possible use of nuclear weapons. Newer nuclear weapon systems usually incorporate improved command and control features and improved resistance to accidental detonation. There are also those, however, who believe that new weapon systems have sometimes emerged not because of any particular military or security consideration, but rather because technology (in conjunction with bureaucratic and other forces) may take the lead, creating weapons for which needs have to be invented and deployment theories have to be readjusted. In this connection, concern has been expressed about the extent to which scientific and technical manpower is engaged in military research and development and that such involvement leads to the production of new and more sophisticated weapons.

An action-reaction phenomenon in arms competition among States cannot be excluded either as one influential aspect in the ongoing development of nuclear weapons. Many believe that this phenomenon reflects the interplay of expectations between the States, which results in similar systems being copied and defensive and offensive systems being designed in the expectation of new challenges from other States. In their view, the problem is exacerbated by the secrecy that surrounds the weapons research and development process in many countries, which leads to worst-case assumptions on the part of other States of the putative threat that such developments may pose. They are also concerned that the military research and development effort's own momentum and the resulting new weapons options could thus contribute to an open-ended arms competition.

B. Main Features of Past Developments

1. Nuclear Warheads

The first turning point in the development of warheads was the successful utilisation, in the early 1950s, of fusion reactions in nuclear explosives. This made it possible to produce thermonuclear devices capable of releasing extremely large amounts of energy.

As a result, through the 1950s and early 1960s, the tendency was generally to build more powerful weapons, i.e. with a greater explosive yield. The fact that throughout most of the period a bomber force was the main means of delivery was an important consideration as well. This trend was also in line with the prevailing doctrinal concept at that time of the use of nuclear weapons against population centres

On the other hand, a development to reduce the size and weight of warheads was also initiated in the 1950s. As a consequence, it became technically feasible to produce various small nuclear charges for a variety of non-strategic uses, thus considerably expanding the potential role of nuclear weapons in a conflict situation. For instance, nuclear artillery shells were first tested in 1953.

The technical development of nuclear warheads entailed not only reductions in their size and weight in absolute terms. It was also possible to increase their yield-to-weight ratio, particularly by the use of fusion devices. One result of this was that it became possible to put multiple warheads on strategic missiless. For strategic warheads, the trend towards larger yields was reversed during the 1970s, especially in the United States. The fact that warheads with considerably lower yields were introduced was related mainly to significant improvements in the accuracy of the delivery systems, in particular ICBMs. The higher accuracy entails a much higher ratio between the lethality and the yield of a nuclear warhead, when employed against a small ("point") target.

In addition to these major developments regarding nuclear warheads, several other less known but related technological improvements were also pursued. They concerned warhead safety, reliability, versatility and hardening against adverse environments. Safety measures were aimed at minimising both the risk of accidents in handling the weapons and the possibility of unauthorised use. For this purpose insensitive high explosives were introduced, as well as a multitude of arming and safing devices, including the PALs. Reliability of warheads was enhanced in several ways, such as by developing special materials to prevent deterioration of weapon components or special designs to withstand the tremendous acceleration in a gun tube. Versatility was enhanced by designing a warhead in such a way that different yields could be selected easily.

During the 40-year period from 1945 to 1985 about 100 accidents have been reported that damaged and might conceivably have caused unintended detonation of a nuclear weapon. These accidents include airplane crashes, unintended dropping of nuclear weapons from airplanes, explosions in ammunition depots or fires on board submarines. So far, however, none of those accidents has led to the unintended detonation of a nuclear weapon.

One way of pursuing versatility, through diversification of the nuclear inventory, is the "tailoring" of warheads to enhance or suppress various effects of the explosion. This is done by selecting different fission-to-fusion ratios to produce the desired total yield, combined with different designs of the casing and other structural components of the warhead.

The best-known example of "tailoring" is the "enhanced radiation" weapon or the so-called "neutron bomb", a weak fusion device with a special design. Basically, it could produce much higher levels of initial neutron radiation than an ordinary fission weapon of equal yield, while at the same time suppressing the level of blast and heat, thus considerably reducing the expected damage to the surroundings. The United States developed and tested a neutron warhead but did not put it on the production line. The Soviet Union limited its efforts to a research programme. Regarding France, it has indicated that the actual state of research would allow it, if necessary, to produce a neutron weapon.

It appears that some other technological developments related to the warhead that had been pursued by nuclear weapon States were ultimately suspended or abandoned. For instance, it is technically possible to produce warheads with very low explosive yields (by deliberately not making full use of the fissile material). However, there were concerns that a wide deployment of such warheads, the so-called "mini-nukes", with their limited radius of material damage, would possibly lead to a "conventionalisation" of their use. After some international debate, the United States, the United Kingdom and the Soviet Union declared that they would not for the time being deploy nuclear weapons with small yields in such a way as to blur the nuclear threshold.

The 1980 United Nations study on nuclear weapons noted in connection with nuclear warhead developments that the reduction of their physical size was, in some applications, close to the limits set by the laws of physics, and that despite the research and development in the field of special types of warheads, no major breakthrough was likely to occur with regard to the basic design principles of nuclear explosives. It concluded that the evolution of delivery systems seemed likely to carry more practical importance in the future, as it had already done for some time. This conclusion still seems valid.

2. Delivery Systems

The only nuclear warheads ever used in an armed conflict were delivered to their targets - Hiroshima and Nagasaki - in 1945 by ordinary bomber aircraft. Other forms of delivery vehicles for nuclear warheads were developed later. For instance, ground-launched ballistic missiles were first introduced in the 1950s and submarine-launched ballistic missiles around 1960. The first cruise missiles (CM) with nuclear warheads were developed in the 1950s, while longer-range CMs with sophisticated navigation aids became available much later - in the late 1970s.

The early versions of ballistic missiles were fairly inaccurate and were thus considered to be unable to hit any targets smaller than cities or large installations (industrial, commercial or military). If the missile was intended to destroy a point target, such as one of the adversary's missile launchers, a high weapon yield would be needed to compensate for the possible deviation of the warhead from its calculated trajectory.

Missile accuracy is usually given in terms of the circular error probable (CEP), defined as the distance from an aiming point within which, on the average/ half the shots aimed at this point will fall.

Using this concept, assessments of the efficiency of various missile systems can be illustrated. For example, a 1 Mt nuclear warhead may be needed in order to destroy a particular hardened structure if the CEP of that nuclear weapon is 1 km. The same effect could result from a 125 kt warhead with a 0.5 km CEP accuracy, or a 40 kt warhead with 0.33 km CEP. Thus, increased accuracy meant that smaller yield warheads could replace high yield warheads as a threat to these types of targets.

In other words, the nominal yield could be decreased while the effective lethality of the weapons increased. This had rather profound military effects, as it made it increasingly more difficult to protect land-based missiles from an attack, i.e. a first-strike aimed at eliminating these weapons. This required increased "hardening" of the missile silos since the existing ones no longer provided sufficient protection. This consideration, in part, bolstered further development of SLBMs, which were generally considered far less vulnerable than any type of nuclear weapons, and more recently also led to the development of mobile ICBMs. It also prompted quantitative increases of the strategic inventories. It was argued by strategists that if ICBMs were left vulnerable to first-strike attacks, this could conceivably force the respective country to prepare for a possible use-them-or-lose-them scenario. Conversely, measures to decrease their vulnerability would support the deterrent posture of the respective country by enhancing its "second strike" capability. One such measure is the development-of mobile ballistic missiles.

At the time of the preparation of the 1980 United Nations study on nuclear weapons, definite CEP values for different existing nuclear weapon systems were not available, for reasons both of military secrecy and, presumably, insufficient basic knowledge. Also CEP values varied considerably depending on the system in question. Some of the academic sources at the time had given estimates for both United States and Soviet ICBMs as approaching a CEP of about 200 metres. Other weapon systems were generally considered less accurate, an aspect that was given a great deal of attention in subsequent years. Accuracy has improved considerably since then.

Another development in delivery systems was the introduction of multiple warheads on missiles. The first generation of multi-warhead systems became known as "multiple re-entry vehicles" (MRV). The missile carries several warheads (2-4), thus considerably increasing the probability of the target's destruction. The next generation, called "multiple independently targeted re-entry vehicles" (MISV), is capable of directing each warhead against different individual targets located at varying distances up to perhaps 500 km from each other. This development has increased the effectiveness of ballistic missiles.

The MRV warheads were deployed in the United States towards the mid-1960s on SLBMs and MIRVs around 1970 on both ICBMs and SLBMs. By the 1980s, both the United States and the Soviet Union had deployed either MRVs or MIRVs on their major weapon systems. The other three nuclear weapon States had also been developing similar technologies, which some of them deployed in subsequent years.

As early as around 1970, there was some discussion regarding the development of a third generation of multiple warheads, the so-called "maneouverable re-entry vehicle" (MARV) technology. The main characteristic of these warheads would be their ability to readjust their flight patterns after having re-entered the atmosphere. The main purpose of this would be to increase their probability of penetrating an ABM defence. With the aid of autonomous sensors, the MARV might also be able to attack mobile targets with a higher degree of accuracy.

The American and Soviet cruise missiles deployed during the 1960s (on aircraft and, by the Soviet Union, on ships) had comparatively short ranges, up to about 600 km. They were believed to be intended for use mainly against surface ships.

By the 1960s, the development of modern cruise missiles had gained momentum, owing to advances in propulsion and navigation technology, even though problems remained. With ranges up to at least 2,500 km and an expected accuracy of a few tens of metres, cruise missiles were envisaged to fill both a strategic role - in their air-launched version (ALCM) - and theatre roles when deployed on ships (SLCM) or on ground-mobile launchers (GLCM).

There was also ongoing development as regards platforms for the launching of various types of missiles. By 1980, further hardening of ICBM silos was not deemed appropriate. For this reason, a great deal of attention was devoted to various schemes for ground-mobile ICBM launchers. The Soviet Union had already deployed its SS-20 medium-range ballistic missile in a mobile mode.

The main features in the development of strategic submarines, aside from improvements of their missiles, were related to increased radius of action and more silent propulsion. More advanced navigational aids allowed increased precision in fixing the position of a submarine and hence increased accuracy of SLBMs.

Aircraft were modernised and modified to accommodate new types of nuclear weapons (ALCMs) or larger numbers of weapons, but no aircraft seemed to have been designed to serve solely as a nuclear weapons platform.

3. Other Components

The other components of modern nuclear weapon systems were also subject to various technological developments in the field. Guidance systems and some components of C^3I systems were of particular interest, even though they are too complex to be explored here in all their possible combinations.

Guidance systems for missiles, and for some types of mobile platforms, utilise many different techniques. To improve long-range navigation, the inertial guidance system that had long been used needed to be supplemented by intermittent, precise position information provided, for instance, by a set of satellites in geostationary orbit.

For homing a weapon on the target, a number of techniques are being developed, primarily for use in the conventional arms field. The essential part of these homing systems are sensors, which include a variety of radar, infra-red and laser devices. It was believed that some of them were possible to use within strategic vehicles and others to enhance the accuracy of various tactical nuclear weapons. Any actual deployment of these technological developments was not, however, thought to have taken place before 1980.

Improvements in C^3 I technology—which exploit the rapid advances in electronics and information and data processing—aim at increasing the reliability, survivability and speed of the systems. By 1980 additional impetus had been given to this work by some recently detected flaws in the United States C^3I system. A reliable communications system is also crucial to nuclear war fighting.

C. Main Features of New Developments

Unlike in the 1950s, 1960s and early 1970s, when major technological breakthroughs occurred in and number of important areas and took place at an accelerated speed, the technological development of nuclear weapon systems in the 1980s has been in general less dramatic and largely focused on several specific areas as a follow-up to previous developments. Changes in emphasis on nuclear war fighting and space-based defensive systems have also been noted.

In the area of nuclear warheads, technology has advanced incrementally to make warheads safer, more reliable and more flexible, i.e. capable of variable yields, possibly also requiring less fissile material to produce a given yield.

Apart from this, efforts are reportedly being made to improve warhead technology in several specific ways. One concerns the continued development of an earth-penetrating warhead, which could burrow deep into the ground before exploding. It would be used to hold underground targets/ primarily command and control centres, at risk. Because this would place command and control itself at risk, it could be viewed as a serious development with potentially destabilising consequences. Another effort is related to the MARV concept described above.

However, despite the enhanced capability that both penetration and MARVed warheads may offer, reportedly neither technology has been deployed so far on a weapon system.

Reportedly, the trend towards greater accuracy of ballistic missiles continues. During the 1980s, this does not seem to have been accompanied by continued lower yields of strategic warheads, however. For instance, the MX ICBM is described as carrying warheads with selectable yields of 300 or 475 kt each, as opposed to the 170 kt warheads on Minuteman-III missiles deployed in the 1970s.

In the area of delivery vehicles, several new developments have taker, place. Concerning land-based missile forces, two features are of particular military significance: the more widespread replacement of liquid fuel rockets with solid fuel and the introduction of mobile ICBMs.

Apart from considerably diminishing the safety risks involved in handling liquid fuel, the most important aspect of the use of solid fuel is that it significantly reduces the time necessary to prepare missiles for launch, thus enhancing military preparedness of nuclear forces. Solid fuel technology was introduced in the United States in the 1960s and in the French missile forces beginning in the early 1980s. It is a more recent development in the Soviet Union where it has been implemented only for the most modern missile systems. China still uses liquid fuel for its missiles.

Development of mobile missiles has continued and also covers the strategic area. There are currently two mobile ICBMs, the Soviet SS-24 and SS-25. Both missiles are solid-fueled. In the United States a discussion has been under way on the possibility of developing a new single-warhead road-mobile ICBM (Midgetman), or deploying the existing MX ICBMs on railroad cars. Neither plan has yet been formally endorsed by the United States Government.

The major developments concerning the strategic air forces of nuclear weapon States have been the advent of stealth technology for advanced bombers and air-launched cruise missiles.

Stealth technology is a combination of aircraft design, improved electronics and special material coatings designed to absorb radar waves. This technology is intended to enable aircraft and missiles to fly undetected by existing radar systems in carrying out their mission.

Countermeasures to stealth technology are being explored, which include various special forms of radar, such as very low-frequency, bistatic or carrier-free radar. None of these techniques is yet capable of negating stealth technology, however.

In the United States, the B-2, or Stealth Bomber, is the most advanced aircraft to employ stealth technology. It can carry both conventional and nuclear weapons. Among the B-2 missions is destruction of mobile nuclear missiles and hardened command centres. The bomber has been developed and flight-tested, but not yet deployed.

The United States B-1B bomber is also a new development, in that it is a dual-capable, long-range strategic bomber capable of conforming to a multitude of roles-ranging from deep-strike solo penetration of enemy territory to maritime surveillance and aerial mine-laying. These varied roles have not previously been combined into the capability of a single aircraft. Some 97 B-1B bombers have been deployed during the 1980s.

The Soviet Union has developed the Blackjack (TU-160), a supersonic bomber for penetration missions. It also has the capability for stand-off missions, and may also possess a maritime role. The deployment of this aircraft began in the late 1980s. By the end of 1989, 17 aircraft of this type had been deployed.

Air-launched cruise missiles (ALCMs) are designed to allow manned bombers to avoid having to face the challenge of heavy air defences while performing their mission, as they are able to launch their ALCMs before penetrating enemy air space. Thus, ALCMs effectively replace the gravity bomb and give older bombers, such as the American B-52 or the Soviet Bear, increased longevity. The sophisticated guidance system employed on ALCMs also increases the accuracy of bomber-delivered weapons.

Research is also under way for advanced cruise missiles (ACM) that would use stealth technology, as well as for an advanced strategic air-launched missile that would achieve supersonic speeds. Both these types of missiles would be providing maximum penetration ability against air defences. Two new cruise missiles under development in the Soviet Union reportedly employ stealth technology, the short-range attack missile (SRAM) AS-16 and the supersonic AS-X-19 ALCM. France is also developing a miniaturised independently targetable warhead, the TN-75, to be carried on a modified M-4 ballistic missile that may incorporate stealth technology.

In the area of maritime nuclear forces, apart from continuing efforts to make nuclear submarines ever more quiet and to improve communication links with them, the two main development features of the 1980s have been the continued replacement of single-warhead and MRV missiles with MIRVed missiles, on the one hand, and the development and deployment of sea-launched cruise missiles (SLCM), on the other. There has also been a corresponding improvement in the CEP, both of the MIRVs and SLCMs.

Both the United States and the Soviet Union are thought to be improving their SLBM forces With regard to accuracy. Analysts have suggested that the United States Trident-II (D-5) will have a CEP of about 120 metres, similar to that of the Minuteman-II ICBM. The new Soviet SLBMs also have a higher accuracy than their predecessors. Analysts further suggest that if SLBMs have a high degree of accuracy it would make them less of a retaliatory weapon and would enhance their usefulness for counter-force strikes.

The increased range of, *inter alia,* the Soviet Union's current SS-N-20 on the Typhoon submarine and the SS-N-23 on the Delta-IV allows these submarines on patrol to remain close to or within the Soviet Union's home waters. The Trident missile has a similar range. This means that the survivability of the submarines is increased, which is thought to enhance strategic stability.

As regards the SLCMs, their range and accuracy has considerably improved. Reportedly, the United States is deploying a new vertical launching system (VLS), which is designed to launch anti-submarine, anti-aircraft, anti-ship and land attack missiles from the same set of launching tubes.

On the whole, it appears that the technological developments throughout the 1980s more or less followed the main trends that were evident prior to that period. Thus, no major breakthrough has yet occurred with regard to nuclear weapon systems, although research work continues in several areas.

While some technological developments - in such areas as remote sensing and the use of satellites - have improved verification capabilities, the development and deployment of weapons systems incorporating advanced technologies have posed more complex problems for verification of nuclear arms limitation and disarmament agreements.

Considering that the Soviet Union and the United States have historically always taken the lead with regard to the technological development of nuclear weapons, it is reasonable to assume that the outcome of their negotiations on the reduction of their strategic nuclear weapons may, in many important aspects, decisively determine both the pace and trends of possible future developments in this field.

D. Ballistic Missile Defence Systems and Countermeasures

Parallel with technological developments in the field of nuclear weapons, as various times efforts were made by nuclear weapon States to develop defence systems against strategic ballistic missiles carrying nuclear weapons to decrease the effectiveness of such systems.

Both the United States and the Soviet Union carried out research work in this field as early as the 1950s and deployed one anti-ballistic missile system each. While the United States system (which was later dismantled) was deployed for the defence of an ICBM field, the Soviet Union's Galosh system (which still exists) was built around Moscow. In 1972, by mutual agreement, the two sides limited deployment of the systems and placed various restrictions on future development and deployment of anti-ballistic missile systems. In 1974 they agreed to limit further such deployments to one site in each country, but only the Soviet Union has chosen to exercise its option under this agreement to maintain an operational ABM site.

For a long time it was suggested that the large phased array radar at Krasnoyarsk was intended not only for early warning of an ICBM attack, but also for ballistic missile detection and tracking. Further, the United States believed the facility could form a critical building block in a nationwide ballistic missile defence (BMD) system that the Soviet Union might have planned, and that it was in violation of the ABM Treaty. In October 1989 Soviet Foreign Minister Eduard Shevardnadze acknowledged that the Krasnoyarsk radar was in violation of the ABM Treaty and stated that it would be dismantled.

Work on various BMD technologies continued and in the 1980s interest in the development of BMD capability was renewed in the United States. This was related, in addition to various political-strategic considerations, to the emergence of new technologies.

At present, research and development of strategic defence systems are progressing in a number of directions, which could lead to systems that might be used against RVs of ICBMs and SLBMs, or against the buses carrying the RVs or against the missiles themselves.

Unlike the situation with earlier ABM weapons, which focused on interception solely during the terminal phase of an RV's flight, interest in new BMD weapons turned in the 1980s to the destruction of ICBMs and SLBMs along their entire trajectory.

There is a whole array of existing and conceptual weapons technologies under consideration for use in BMD. System components could be either ground-, air- or space-based. There are several basic types of new BMD weapons being researched: kinetic energy weapons (KEW), lasers and particle beams.

In a kinetic energy weapon projectiles are hurled at high rates of speed and the force of its impact alone disables or destroys its target. The projectiles could be accelerated by non-conventional means such as electromagnetic "rail-guns".

Another class of potential weapons are lasers, which can be sea-, air-, space-or land-based. If the laser itself is ground-based, the laser beam, theoretically, can be directed onto a target by mirrors based in space.

Another type of potential weapon is based on the use of particle beams. These weapons would accelerate atomic or sub-atomic particles to near the speed of light. The beam would then penetrate the target and disrupt its electronics and other components. There are a number of other technologies that might be used for weapons purposes, although they remain highly theoretical. One is the X-ray laser, which would be pumped by a nuclear explosion. Another is the "plasmoid" defence, which is a cloud of energized atomic nuclei and electrons that affects warheads.

Possible countermeasures include shielding of ICBMs or RVs. In addition, decoy RVs can be installed in ICBMs to distract weapons or cause identification problems for tracking systems. It is also possible to shorten the boost phase of a missile by increasing its speed at launch, thus going a considerable way towards negating the ability of the other side to destroy fully loaded ICBMs before they release their RVs.

In the 1980s, as military satellites became more integrated into military observation, communications and weapon guidance, their importance as targets also increased. Renewed focus on this field also arose as a result of a belief that a number of ballistic missile defence technologies could find an initial application as anti-satellite (ASAT) systems.

Both the United States and Soviet Union have carried on research, development and testing of ASATs. The Soviet Union has tested a co-orbital interceptor ASAT, while the United States has tested an air-launched direct ascent missile. The United States suspended its programme in 1988.

ASATs can be deployed in a variety of ways. They can be used to counter strategic defence. Many satellites would be needed to track, identify and target any incoming ICBMs. The destruction of these satellites would be devastating to nearly all types of BMD systems. ASATs could also be used to attack space-based BMD kill-mechanisms.

There has been considerable debate over the feasibility and merit of the United States strategic defense initiative (SDI) put forward in 1983. The debate has taken place not only between the United States and the Soviet Union, but also between the United States and its allies, within the United States itself, and in many other parts of the world.

The Soviet Union has been carrying out research into technologies that could be used in a BMD system. It has, however, officially declared that it has no integrated large-scale BMD research programme, that all its BMD research is conducted within the limits of the ABM Treaty and that it has no intention to create and to deploy a nation-wide ground-based or space-based BMD.

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TACTICAL NUCLEAR WEAPONS— DO THEY HAVE A FUTURE?

The Bargaining Chips

Political changes are taking place so rapidly in Europe that even the boldest predictions are outdated within a few months.

The unique feature of the current situation in Europe is the asymmetry of political and military processes. Developing the concept of a common European home, the experts see deep cuts in conventional arms as promising change in post-war political structures. Politically, however, we are now living in an environment which has been changed by the talks on the reduction of conventional forces in Europe (CFE) but which has been only slightly changed in military confrontation. This confrontation is expected to remain high even after full implementation of the cuts called for in phase I of the CFE negotiations.

A lag such as this between political processes and the negotiations on arms control creates further obstacles in the way of any attempt to resolve the problem. It is becoming an increasingly complicated task to measure the political interests of the major participants in the "European concert" with regard to tactical nuclear weapons. And it is also quite obvious that military logic is not applicable in this case.

Any serious political observer can see a certain *rapprochement* in the positions of the Warsaw Treaty and the NATO countries on nuclear issues. The Atlantic Alliance chose a compromise in May when President Bush's initiative prevented a new "missile crisis". The Soviet Union is showing a new flexibility, a willingness to meet NATO half way. This was expressed by Mikhail Gorbachev in Strasbourg and by Eduard Shevardnadze in Brussels. It is obviously counterproductive to discuss the ultimate goals when we have not yet taken the first step. WTO can only propose its own definition of minimal deterrence, and hope that in the long run NATO will discover the incompatibility of nuclear weapons with the new emerging European security system based mainly on political guarantees.

This means that for the foreseeable future we must accept an affirmative answer to the question: Do tactical nuclear weapons have a future? This triumph of pragmatism requires an effective negotiating strategy, based on a step-by-step approach and on an assessment of a tactical nuclear balance and an analysis of the interdependence of nuclear and conventional forces.

Paradoxes of Tactical Nuclear Balance

During the 1980s the development of a nuclear balance in Europe was an important issue for Western experts. In the early 1980s they concentrated on a comparative assessment of theatre nuclear forces, but attempts to balance Soviet SS-20s with American Pershing-II and gound-launched cruise missiles (GLCMs) and to resolve the missile equation were never convincing. Following the INF Treaty such an analysis lost ground, and instead of evaluating combat capabilities, experts prefer to manipulate statistics without drawing any conclusions on the balance itself.

The official assessments demonstrate the traditional divergence. NATO emphasises that an enormous advantage in tactical missiles creates a total imbalance in favour of the Warsaw Treaty countries: the most dramatic expression of that position may be found in the Pentagon's annual report "Soviet Military Power". The Soviet Union insists that a NATO advantage in ground-attack nuclear-capable aircraft counterbalances other disadvantages and that there is more or less parity in the nuclear potential of the two alliances.

Reliable information is available only on one type of tactical nuclear weapon—tactical missiles or launchers—where we can assume that WTO forces are more than 10 times greater than those of NATO. It is rather difficult to find any logical reason for such a gap other than historical Soviet devotion to missiles. We can however perceive the absurdity of any attempt to draw general conclusions concerning a nuclear balance from this disparity.

Nuclear balance in Europe encompasses the qualitative and quantitative characteristics of a very broad spectrum of weapons, and even if we exclude Soviet and United States strategic systems targeted on Europe, French and British strategic forces, and sea-based weapons—and these are very serious limitations—it is still difficult to establish a balance. Even if we choose the simplest approach and take only three components of a balance—tactical missiles, nuclear artillery and nuclear-capable aircraft—the resulting comparisons can be Only an approximation.

As regards nuclear artillery we can be sure that in two or three years WTO and NATO will have strict and rather low ceilings on tubes with a calibre of 100 mm and more. But even the precise definition of the artillery established in Vienna is not of much help in determining nuclear capabilities. It is not too hypothetical perhaps to suggest that under a general ceiling both sides will have approximately the same number of nuclear-capable artillery systems.

Historically, a sharp disparity existed in nuclear artillery postures and combat missions. For NATO it was a genuine tactical nuclear weapon deployed on a broad scale and performing an important role in deterrence—to say nothing of its self-deterring effect. WTO on the other hand did not deploy any nuclear artillery up to the mid-1970s—according to Western sources, since regrettably there are no official Soviet figures on the matter. Then it began to introduce a large inventory of self-propelled and nuclear-capable artillery and during a 10-year period it created a potential comparable to that of the other side. It would seem that no one in NATO is seriously worried about this shift: perhaps the reason for that indifference is the diminishing military value of nuclear artillery.

As regards nuclear-capable aircraft we find a great many difficulties and uncertainties. The contradictions over aircraft are probably the most vital issue in the CFE talks, and it would appear that the negotiators are not going to come to any acceptable definition of ground-attack or strike aviation. But even if they agreed in Vienna on an overall ceiling for combat aviation (including interceptors), we would not be any closer to breaking the deadlock with regard to air-borne tactical nuclear weapons.

Both sides have their reasons for claiming that the other side enjoys a significant advantage in nuclear-capable aircraft. Soviet officials insist on NATO superiority in carrier-based aircraft. Of the total of 1,630 aircraft, according to WTO data more than 50 per cent can be considered nuclear-capable. NATO experts refer to Soviet medium bombers and land-based naval aircraft. The report “Military Balance”, which is quite reliable, gives 2,300 nuclear-capable aircraft for WTO and 2,200 for NATO. However, these figures do not prove the existence of parity.

It may be possible to compare strike aviation combat capabilities with the help of some mathematical models, but such a method would become ineffective after the introduction of air-to-surface tactical nuclear missiles. These stand-off weapons are the least disputable elements of NATO's so-called "modernisation programme" and have some chances for deployment in the mid-1990s. The same can hardly be said about follow-on-to-Lance (FOTL)—anti-tactical advanced cruise missiles (ATACMs).

The most unclear element of the nuclear balance in Europe is the number of tactical warheads. The United States is believed to possess about 4,200-4,300 bombs, artillery shells and Lance missile warheads in Europe, though this figure can hardly be taken for granted. About 200 British and 250 French tactical warheads should be added to arrive at a total. There is however virtually no information on the Soviet arsenal, with the modest exception of the fact that 500 warheads were withdrawn from Eastern Europe in 1989. Western experts assume that up to 8,000-10,000 warheads are deployed in Soviet forces—this is perhaps a gross overestimate—but that huge disparity did not prevent NATO from reducing its stocks by 2,500 warheads during the 1980s. Moreover, further unilateral cuts are being considered and, as is known, the latest Nuclear Forces Requirement Study prepared by SHAPE recommended the withdrawal of another 1,000 warheads.

All these paradoxes could have only one rational explanation: there is no such a thing as a tactical nuclear balance in Europe. The total number of tactical nuclear weapons is so high and their real military value is so low that it is possible to balance 10,000 warheads with 2,500, and 1,600 missile-launchers with 136. It is highly probable that during the past tactical nuclear build-up and the present build-down the strategists of both alliances never seriously took into consideration the parameters of the other side's posture. It is also highly probable that strategic requirements were not the dominant factor, but rather the military-bureaucratic inertia.

The Interdependence of Conventional Forces and Tactical Nuclear Weapons

We must begin with one obvious but nevertheless surprising postulate directly connected with the aforementioned paradox: there are no such things as tactical nuclear forces. It is not enough to state that tactical nuclear weapons are dual-capable systems—they are organic to Army corps and Air Force wings, and operable through the same C^3I (command, control, communication, intelligence) system. The only specific feature is the so-called "request sequence" mechanism (which is of doubtful effectiveness).

Certain strategic implications may be derived from this postulate, namely the difficulty—to put it mildly—of forming any tactical nuclear reserve at the early stage of a conflict: "Use it or lose it". But more important nowadays are the disarmament implications. France and the United Kingdom will probably find a way to keep their tactical nuclear weapons untouched during phase I of the CFE talks; this is less probable for the United States. As for WTO, there is no doubt: it is impossible to implement the planned cuts without deep reductions in the nuclear potential.

It looks as if no one is particularly concerned about artillery. It is generally accepted that as a nuclear delivery system it has no future. There is a lot of fuss about aircraft but in a couple of months the negotiators will leave the generals to deal with the nuclear implications. The source of real concern, however, is the only element of nuclear potential that remains beyond the framework of current talks: tactical missiles.

Even a prejudiced observer cannot say that deployed missiles seriously affect the strategic situation in Europe, and it is difficult to expect that the introduction of Hades and ATACMs with "appropriate counter-measures" on the part of the Soviet Union would add some drastically new features to this situation. The real problem is the race in respect of missile technologies. The emerging technologies as such are the most serious threat to the current disarmament process: they may reduce the cuts and undermine the primary goal, namely, the elimination of the possibility of a surprise attack. The next generation of missiles could provide a number of suitable platforms for emerging technologies—the nuclear functions may become secondary. That is why it is so important to close this "window of vulnerability" and create a comprehensive system of negotiations with appropriate verification structures.

There is another aspect of the interdependence of conventional forces and tactical nuclear weapons that is worth mentioning. For years, even while selling the nuclear programmes, NATO authorities were exploiting the thesis that a sufficient tactical nuclear potential was the indispensable (and the cheapest!) means of neutralising the Warsaw Pact superiority in conventional forces, especially tanks. Nowadays this thesis seems a little outdated, and public relations people at NATO headquarters are developing a new idea— that tactical nuclear weapons have an independent and unique role in the strategy of flexible response. This independent role obviously lacks validity—so does the strategy itself— but as for the "compensatory approach" it looks as if the Soviet generals in their turn could exploit it. Is the modest tactical nuclear potential not the best means of compensating for the NATO advantage in quality of armaments and personnel under equal ceilings? This thesis may already have found its place in the doctrine of "reasonable sufficiency".

The Guidelines for the Negotiation Strategy

During 1989 WTO and NATO were gradually approaching an agreement on the need for negotiations on tactical nuclear weapons. But even with this agreement there remain a number of crucial problems concerning the participants, the goals, and the subject of future talks that must be resolved in 1990.

The rigid interdependence between conventional forces and tactical nuclear weapons creates a kind of linkage between formally independent talks, and the best guideline for the negotiators will probably be the projection of cuts settled in Vienna onto nuclear postures. This guideline does not however fit in with the rapid changes in the political situation. Diplomats will hardly have time, as they had in Vienna, to settle the mandate and they should be prepared to withstand the pressure to achieve quick and tangible results.

In those circumstances the very need for talks could become questionable. Why could the two alliances not proceed with unilateral cuts and fix the ceiling for minimal means of deterrence later on? There are at least two serious factors in favour of negotiations. The first is verification: it is too complicated a question for any superficial analysis. The second is stability: the talks create a suitable mechanism for control of the changes and therefore enhance stability. But this mechanism should be very effective in projecting political dynamics into the strategic realities.

It is rather difficult to provide such effectiveness through the traditional rules and procedures of negotiations aimed at the establishment of a balance of forces on a certain level. Why should we establish a balance if we never had any? Such an artificial method would be very time-consuming and rather inflexible. Perhaps we should view tactical nuclear balance as a general goal that can be reached when minimal means of deterrence are on the agenda. In the early stages however one could accept a non-traditional approach based on asymmetrical cuts that would not eliminate all the present disproportions immediately.

Only this asymmetrical step-by-step approach can provide acceptable answers to a number of difficult questions relating to negotiations. For the first stage it is possible to identify the three most controversial questions: the proposed answers are purely theoretical.

The first question focuses on the warheads. The task of imposing limits on them is of course urgent and deserves high priority, but taking into consideration the sparsity of data and the problems of verification, it would be better to leave it to the second stage. In the beginning the negotiators will be preoccupied with delivery systems and can keep an eye on the unilateral cuts.

The second question touches on the delicate matter of British and French tactical nuclear weapons. The uncompromising attitude of these countries to encroachment on their nuclear forces is well known, and here we could easily take the path leading to the all too familiar deadlock. There is only one way to avoid it, namely to keep British and French tactical nuclear weapons outside the framework of the first stage and to concentrate again (as in the INF Treaty) on United States-USSR forces. Of course, European States will be participants in the negotiations.

The third, and most difficult, question relates to nuclear-capable aviation. NATO decided to ignore this question and now the Soviet Union is facing the uneasy decision whether or not to lay aside the air-based tactical nuclear weapons and concentrate negotiations on land-based aircraft. This decision depends very much upon the essence of the compromise with regard to aircraft that will surely be reached in Vienna. The satisfactory agreement on intercepters may encourage Soviet authorities to demonstrate flexibility on tactical nuclear weapons, but the grand sacrifice in the CFE talks could prompt new attempts to reduce the ceiling for tactical nuclear weapons. One thing is clear—it will be much more difficult to reach an agreement over the broad agenda, if it will include aircraft.

Rational and mutually acceptable answers to these questions could provide a guarantee for dynamic progress in the negotiations. It may also be useful to work out several scenarios.

One of them could be the elimination of nuclear artillery. It is obviously not worth while to impose certain sub-ceilings on nuclear calibres under the overall ceiling settled at the CFE talks. Verification could pose numerous problems for any attempt to limit the nuclear shell stocks. Besides being the most desirable from the political point of view the "zero option" is the most feasible.

Then there is the missile scenario, which includes a number of intermediate decisions. One of them could be the asymmetrical ceiling with an equal and rather low sub-ceiling (about 50 launchers) for Central Europe. Another is the definition of two types of tactical missiles according to range (up to 150 km; 150-500 km). The "zero" proposal on longer-range missiles would mean exchanging 650 Soviet and WTO deployed missiles (R-17 or Scud B) for NATO plans on the FOTL missile (probably ATACMs). Obviously for both sides missiles will remain very useful bargaining chips for the foreseeable future.

After these initial reductions of tactical nuclear weapons, the nuclear warheads will probably become a matter for negotiation, and as a preliminary scale we could take 1,000— this figure is surely of some abstract importance. Such a potential cannot be called symbolic, but it is much less destabilising than existing arsenals. After that, we can again discuss the total elimination of tactical nuclear weapons and a nuclear free Europe.

TACTICAL NUCLEAR WEAPONS AND DISARMAMENT PROSPECTS

Fundamental changes for the better are now under way in international relations, particularly in the East-West relationship. These changes have opened up real prospects for a process of genuine and substantive disarmament in almost every field. However, the situation with regard to tactical nuclear weapons is quite conradictory. These weapons belong to the category of non-strategic nuclear weapons, in which the first nuclear disarmament steps were taken in implementation of the Treaty between the United States and the Soviet Union on the Elimination of Their Intermediate Range and Shorter-Range Missiles—the INF Treaty. Yet, tactical nuclear weapons and naval forces are the only fields of major military relevance on which negotiations have not yet begun, for several reasons.

For one thing, the political positions of the two major military-political alliances differ widely, and for another, extremely complicated problems are involved in finding the proper approaches to such negotiations and in dealing with the related military and technological aspects. The present article will deal only with the relevant positions espoused by the States members of NATO and the Warsaw Treaty, taking into account at the same time the diverse, yet basically constructive, views of Governments, politicians, scientists and scholars in numerous non-aligned and neutral States with regard to disarmament in tactical nuclear weapons.

Significance of Tactical Nuclear Weapons and Inherent Dangers

In discussions on security and disarmament policies. the subject of tactical nuclear weapons is generally underestimated. As it is generally open to question whether nuclear weapons can contribute to stability in a time of crisis, it is reasonable to have the same doubts with regard to tactical nuclear systems, particularly battlefield nuclear weapons with the shortest ranges.

The reasons are twofold. First, large arsenals of such weapons are stationed in Europe along the line of contact between the world's two major military alliances. In times of crisis or in conflict situations a relatively relaxed permissive action regime is required if the tactical nuclear system is to have any political or military effect at all. What is more, there is a potentially high risk of losing such weapons at an early stage, in view of the dynamics with which an assumed conflict would unfold. The principle of "Use it or lose it" illustrates this particularly dangerous situation.

Secondly, the argument that tactical nuclear weapons serve "sub-strategic deterrence" is highly questionable. Nuclear deterrence is itself a questionable security concept since its functioning is based on confrontational thinking, a progressive modernisation of nuclear weapons and the resultant destabilising tendencies. It involves a host of imponderables and, in the final analysis, it makes nuclear proliferation inevitable. However, the confidence which the West has been placing in that strategy must be taken seriously. Therefore, one can envisage a concept of minimum nuclear deterrence to serve over a longer period as a step on the road to common security in a demilitarised world.

However, this is a proposition which cannot be maintained with respect to tactical nuclear weapons. At the same time, even for that category of weapons, partial solutions will be inevitable, primarily in view of existing political positions. Even if one saw nuclear deterrence as a guarantor of international security, as its proponents do, it would be difficult to substantiate the purported need for the existence of tactical nuclear weapons and for their further refinement. The complexity of the matter derives from the fact that these weapons generally threaten to upset nuclear stability and call into question the principle of strategic deterrence inasmuch as they are meant to serve as a barrier to the "final escalation", whereas strategic nuclear weapons (as even critics of the concept of deterrence can agree) may well be regarded as instruments of a primarily political value. Assuming that tactical nuclear weapons were really used in an attempt to prevent escalation and to stop a strategic nuclear exchange from destroying the world, their use would lead to the crossing of the "nuclear Rubicon", thus rendering a conflict uncontrollable. As it is the military purpose rather than the destructive power that makes these weapons different from strategic nuclear weapons, it appears that in a scenario such as that described above the chance for de-escalation and a return to reason would be rather slim.

It would take almost blind faith in the concept of tactical nuclear deterrence to believe it would actually function and not to see these weapons as destabilising. In fact, they pose a threat to security. Their very existence and the related modernisation programmes demonstrate a preponderance of military thinking over security needs. The complete elimination of tactical nuclear weapons would have no adverse effects whatsoever on the security of any State, nor would it impair defence and security strategies. Besides, it would make no difference to the non-nuclear weapon States in Central Europe—where such a tactical nuclear exchange would be unleashed—whether they were hit by strategic or tactical nuclear weapons. At the tactical exchange level their territories would already be devastated, and their peoples would be wiped out.

It would be equally adventurous and unjustifiable to believe that tactical nuclear weapons could serve to blackmail developing countries or that they would serve as a security guarantee in the event of any such country acquiring or possessing nuclear weapons. The greatest danger of all is perhaps that tactical nuclear weapons might actually be used in these regions, apart from the potential threat of their being used to knock out large battleships or submarines on the high seas.

Even if it is recognised that the military justification for tactical nuclear weapons is questionable and that the political dangers are considerable, the objective of full disarmament or even reductions in this weapons category would still be very difficult to achieve.

In 1989, the NATO countries reaffirmed their 1983 Montebello decisions on tactical nuclear weapons, that for these holdings, reduced to a minimum, to render the best possible contribution to deterrence the delivery systems and warheads would need to be serviceable, ready for action and effective. Aware of that, the NATO countries have agreed on a number of possible improvements. It is well known that work is under way on a follow-up system for the United States Lance missile and on new air-launched and sea-launched tactical nuclear weapons.

These endeavours are continuing, notwithstanding the sweeping changes on the European continent, which make it more and more difficult to justify politically the need for such systems, not to speak of the deployment of such weapons. Nevertheless, the political positions held by either alliance are already indicative of how difficult future negotiations might become.

Political Positions

The NATO States have consistently pointed to the priority which attaches to the Soviet-American START negotiations as well as to conventional disarmament from the Atlantic to the Urals. In effect, they make the opening of negotiations on tactical nuclear weapons contingent upon results in the above-mentioned fields. It should, however, be noted that, within NATO, positions vary as to what results should be obtained in regard to conventional disarmament before starting negotiations on tactical nuclear weapons. At their summit meeting late in May 1989, States members of NATO adopted a Comprehensive Concept of Arms Control and Disarmament, in which they pointed out the following, under the heading "Sub-Strategic Nuclear Forces":

> "In keeping with its arms control objectives formulated in Reykjavik in 1987 and reaffirmed in Brussels in 1988, the Alliance states that one of its highest priorities in negotiations with the East is reaching an agreement on conventional force reductions .... Once implementation of such an agreement is under way, the United States, in consultation with the Allies concerned, is prepared to enter into negotiations to achieve a *partial* reduction of American and Soviet land-based nuclear missile forces of shorter range to equal and verifiable levels."

The Federal Republic of Germany and a number of smaller NATO countries interpret that as implying that negotiations on that issue should start soon after the conclusion of an agreement at the Vienna negotiations on the reduction of conventional forces in Europe (CFE), while primarily the United Kingdom and—to some extent—the United States hold that such negotiations can get off the ground only if and when the CFE agreement will have been largely implemented, a process which certainly will take quite a number of years for completion.

The basic aspects of the NATO position on that issue can be described as follows:

First, the start of negotiations is made contingent upon the results of the CFE negotiations.

Secondly, the complete elimination of tactical nuclear weapons is expressly rejected, the argument being that

> "the sub-strategic nuclear forces deployed by member countries of the Alliance are not principally a counter to similar systems operated by members of the WTO. [Rather, they] fulfil an essential role in overall Alliance deterrence strategy by ensuring that there are no circumstances in which a potential aggressor might discount nuclear retaliation in response to his military action".

Thus NATO countries merely favour a reduction of tactical nuclear armories leading to equal ceilings at lower levels.

Thirdly, the Western readiness for negotiations expressly relates only "to American and Soviet land-based nuclear missile systems of shorter range". This means that air-based and sea-based tactical nuclear weapons, nuclear artillery and non-American tactical nuclear weapons are left out of the process entirely.

Fourthly, the negotiations contemplated would be bilateral negotiations between the United States and the Soviet Union, to be held in consultation with the allies concerned.

Fifthly, as a matter of principle NATO supports a steady modernisation of tactical nuclear weapons, even regarding it as a condition for further reductions.

In the past, Warsaw Treaty member States accorded top priority to the problems of nuclear disarmament. Beginning in 1986, however, they have focused more on conventional disarmament and on the interrelationship between nuclear and conventional disarmament in Europe. On that score, the positions of the two alliances have come closer. Nevertheless, the Warsaw Treaty continues resolutely to plead for an early start of negotiations on tactical nuclear weapons in Europe and for their conduct in parallel with the CFE negotiations. As to the objectives and principles proposed for these negotiations, NATO and WTO positions still differ widely.

In a declaration adopted at their session held in Berlin on 11 and 12 April 1989, the Committee of the Ministers of Foreign Affairs of the States Parties to the Warsaw Treaty called upon States members of NATO to open negotiations on tactical nuclear weapons in Europe. The Declaration adopted by the Ministers outlined the following fundamental positions of the WTO States:

First, the Warsaw Treaty States consider tactical nuclear arms as essential elements of a surprise attack rather than a necessary component of nuclear deterrence, and they are of the opinion that

> "the retention, modernisation and, all the more, the further build-up of tactical nuclear weapons in Europe would increasingly destabilise the

> military-strategic situation in Europe and would be incompatible with the efforts aimed at resolving the disarmament issues on the continent".

Secondly, the Warsaw Treaty defined as the objective of the negotiations

"the phased reduction and eventual elimination of the tactical nuclear arms in Europe...." Thirdly, the States parties to the Warsaw Treaty believe that

> "mutual renunciation by the sides of any modernisation of tactical nuclear arms would be conducive to creating a propitious political atmosphere for such negotiations...".

Fourthly, these negotiations should cover all kinds of tactical nuclear weapons and their delivery.

Fifthly, although the WTO States held that the final decision as to the participants in the negotiations should be taken only after multilateral consultations, they seemed to favour multilateral negotiations between "all interested member States". They believed that participants should be

> "the nuclear weapon Powers of NATO and the Warsaw Treaty, respectively, [and] in particular those [States] possessing nuclear-capable tactical systems and those having tactical nuclear arms deployed in their territory".

Sixthly, the WTO States reaffirmed their constant support for setting up nuclear weapon free zones in Europe. (In this context it should be recalled that the Soviet Union's proposals of January 1986, aimed at ridding the world of all kinds of nuclear weapons, focused on a global solution to the problem of tactical nuclear arms.)

Negotiating Problems and Possible Solutions

Given the current political attitudes of the East and the West, outlined here, it seems improbable that comprehensive disarmament of tactical nuclear arms will become a reality in the foreseeable future, even if this were the most reasonable solution in the light of the dubious military and political role of these arms. The main stumbling-block is the declared position of Western nuclear Powers that tactical nuclear systems constitute an essential component of nuclear deterrence and military stability. Obviously, this is a security-policy axiom that cannot be refuted by critical arguments. In the final analysis, those advocating the complete elimination of tactical nuclear arms can do nothing but hope and work for the political climate to change to the disadvantage of tactical nuclear armament.

The entire discussion is hampered by enormous political, military-technical and verification problems, which are bound to emerge when it comes to partial solutions. This is due, in particular, to the fact that, on the one hand, delivery systems for tactical nuclear warheads are mostly dual-capable (artillery systems with a calibre of more than 150 millimetres; ground-, air- and sea-based short-range missiles, cruise missiles and stand-off weapons; rocket launchers; aircraft). Moreover, it seems hard to make a definite and verifiable distinction between tactical and non-tactical nuclear warheads. Although there now exists a general categorisation in terms of available warheads, an identity of characteristics cannot be precluded.

The following reduction and disarmament options would be conceivable, although they would in any case be hampered by the complications described above.

First, a comprehensive and global zero-option for all kinds of tactical nuclear arms. As mentioned before, Western nuclear Powers do not agree to it at present, and the People's Republic of China, too, might link this option to its known positions as regards Soviet and American advance moves in the field of nuclear disarmament. Comprehensive disarmament in nuclear-capable tactical delivery systems would be possible and verifiable only in the framework of complete and general disarmament. A global zero-solution for tactical nuclear warheads would encounter intractable verification problems as long as it was not coupled with parallel measures to limit and monitor all stockpiles of strategic nuclear weapons.

Secondly, a mutual Soviet-American renunciation of tactical nuclear arms. For that move, too, there exist no political prerequisites. Verification would be just as problematic as in the case of a global solution.

Thirdly, a third zero-option for Soviet and American ground-based missiles with a range of up to 500 kilometres. Among all conceivable approaches to negotiations, this seems to be the simplest way to reach an agreement on cuts in tactical nuclear arms, with the possibility of extending the INF Treaty to this area just through a protocol. Although such a solution would require far-reaching unilateral disarmament steps on the part of the Soviet Union (which possesses over 1,500 launchers for these missiles whereas NATO has 136 in all), the West is still displaying considerable opposition. However, partial unilateral cuts in such arms by the Soviet Union, pressure by the general public and the nearly impossible modernisation of the obsolete Lance missile system deployed on the territory of the Federal Republic of Germany might soon result in a changed Western position.

Fourthly, elimination of nuclear artillery. Basically, there is a growing willingness both in the East and in the West to reduce these nuclear weapons systems, since there are hardly any doubts as regards the threat they pose to military stability and their senselessness from the military viewpoint. The main problem, however, lies in the dual capability of the respective artillery systems. Since they account, to a considerable extent, for conventional artillery, the issue cannot be resolved simply by eliminating the firing systems. The elimination of the nuclear warheads of those systems by way of negotiation is bound to fail in view of the impossibility of differentiating verification methods.

Nuclear-artillery disarmament is nevertheless possible and realistic. It should be implemented by the unilateral withdrawal of nuclear artillery ammunition by each side respectively, a step which could be accompanied by confidence-building measures and possible voluntary inspections. Moreover, within the framework of a nuclear weapon free zone, effective and comprehensive verification of such a withdrawal would become possible. However, the storage of warheads by nuclear weapon States could also be monitored only in the framework of comprehensive nuclear disarmament.

Fifthly, the reduction of air- and sea-based tactical nuclear arms and their elimination. Cuts in, and the dismantling of, nuclear-capable combat aircraft would be verifiable in principle even though global (bilateral or multilateral) solutions would be extremely costly. Moreover, it is not the nuclear weapon States and their allies alone that possess nuclear-capable aircraft. However, this problem is at present compounded by the fact that there are no realistic political prospects for the political good will of the nuclear Powers, which is required to this end. Precisely defined partial solutions for the reduction of combat aircraft achieved in the Vienna CFE talks would, however, also apply to this area. For the purpose of ensuring political and military stability, great importance is attached to the complete elimination of sea-based tactical nuclear arms. Considering the combat capabilities of such weapons and the temptation to use them against aircraft carriers, other major naval targets and submarines, it would in any case seem most likely for a nuclear confrontation to break out on the high seas. Currently, the political will to tackle this issue appears to be rather weak.

However, there are positive developments in this area. Verification problems could be solved by using sophisticated technical means, above all through effective challenge inspections. The extremely destabilising effects that would result from sea-based tactical nuclear arms during periods of crisis and conflict make it imperative to attach great importance to the reduction of these weapons. The United States and the Soviet Union could initiate a process to that effect, and all other nuclear Powers could join in at a later stage.

Sixthly, nuclear weapon free zones. Zones free from nuclear weapons would no doubt be conducive to disarmament measures in the field of tactical nuclear arms. On the one hand, the status of such zones could be monitored effectively; on the other hand, they would help to bring about a situation between the two alliances in which the presence of tactical nuclear weapons could no longer be justified. As is known, NATO States are strictly opposed to such zones in Europe and at the present time a change in this attitude is not discernible. It would, however, considerably facilitate disarmament steps in the field of tactical nuclear weapons, since the military significance of these weapons within the territories of the nuclear Powers themselves would decline substantially.

Proposed Steps Towards Nuclear Disarmament

In view of current political positions and various technical problems relating to the negotiations, I should like to point out the following steps towards disarmament in the field of tactical nuclear arms, all of which could be implemented in the foreseeable future:

- A third zero-option for Soviet and American land-based missiles having a range of up to 500 kilometres;
- The unilateral elimination by each side of nuclear warheads for artillery systems, together with confidence-building measures and voluntary inspections;
- The elimination of sea-based tactical nuclear weapons.

Such measures, disarmament in other fields and further positive changes in international relations should make it possible to tackle the issue of complete global disarmament in the field of tactical nuclear arms.

THE ROLE OF NUCLEAR DETERRENCE IN NON-PROVOCATIVE DEFENCE

During most of the 1980s, nuclear weapons were the main item of a rather scanty East-West dialogue. Even after the Treaty between the United States and the Soviet Union on the Elimination of Their Intermediate-Range and Shorter-Range Missiles—the INF Treaty—had been concluded in December 1987 and the focus of arms control had shifted towards conventional weaponry in Europe, the question what to do with the shorter-range nuclear arsenals of the two alliances remained high on the international agenda. However, in the wake of the banning of the land-based intermediate-range (500-5,500 km) nuclear forces of the and the concomitant political-psychological "fall-out", this became more a West-West than an East-West issue. Hard as it may be to believe, only twelve months ago the Atlantic Alliance was facing a serious crisis over the question of nuclear "modernisation". In retrospect, and particularly against the backdrop of the stunning, truly revolutionary changes during the second half of 1989 in Eastern Europe, NATO's row over its European-based nuclear weapons looks trivial indeed.

Those in the West who—like this author—only a year ago firmly believed that a swift decision to modernise these weapons was essential to the Alliance's cohesion and further progress in European arms control, have had to realise that they had vastly overestimated the importance of the nuclear question for the new, unfolding East-West relationship. However, those who now claim that it was the prevention of any modernisation decision on NATO's part that cleared the ground for the sweeping political changes in the East are grossly exaggerating the political implications of the nuclear issue as well. The point here is not that nuclear weapons in Europe have ceased to be an important politico-military topic but rather that the events in Eastern Europe have simply changed the ground rules of the nuclear debate. It has become doubtful whether old criteria and parameters still apply. Furthermore, 1989 allowed the prediction that nuclear deterrence and nuclear-arms control would no longer play the same dominant role in the East-West relationship of the 1990s as they did during the preceding decade. This should in many ways facilitate efforts to deal with European-based nuclear weapons in the years ahead.

The Changing Political Landscape in Europe

In just one year all hard-line regimes in Eastern Europe (with the exception of Albania) were toppled by more or less spontaneous and, for the most part, peaceful popular movements. All these countries are now on their way to becoming democracies, with free elections, multiparty systems, market economies and "de-ideologised" armed forces. This development undoubtedly contributes much more to confidence-building in Europe than such actions as the scrapping of thousands of missiles and tanks. The implications for the European security setting are of a fundamental nature.

First, democratic East European countries, even if they are still members of the Warsaw Pact and maintain capable armed forces, do not pose a military threat to the West. Equally important, however, is the fact that democracies between the Elbe and the Bug will not feel threatened by the West either.

Secondly, the pressure for the withdrawal of Soviet forces from these countries is therefore bound to increase, quite irrespective of the arms-control process. The Hungarians have for some time been known to be eager to get Soviet-stationed forces—occupation forces in the eyes of the people—out of their country: the overthrow of the Ceaucescu regime is likely to spur on this effort. In the case of Czechoslovakia, the new Prague government has already entered into bilateral negotiations with Moscow to get rid of the Soviet troops that crushed the "Prague spring" of 1968. It will probably not be very long before similar aspirations arise in East Germany, where more than 350,000 Soviet troops are concentrated. All in all, it does not seem that Soviet-stationed forces in Eastern Europe have much of a future.

Thirdly, related to this development, forces stationed in the West, particularly United States, French and United Kingdom forces in the Federal Republic of Germany, are bound to be cut back very substantially as well. Because of a gigantic budget deficit, the United States is already planning a massive pull-back from Europe. This would of course require fundamental changes in the Alliance's military strategy.

Fourthly, as Eastern Europe turns democratic, the long-time division of the continent is ended and both NATO and the Warsaw Pact lose their predominant role in the European security setting. New, comprehensive security structures, probably growing out of the process of the Conference on Security and Co-operation in Europe, will gradually assume functions hitherto fulfilled by two antagonistic alliances. The process of unification of the two Germanys will provide a strong impetus to this development.

These are the major trends or factors that are bound to shape the future of nuclear weapons in Europe. Above all, if the post-war era of forces stationed in Europe is coming to a close, this will inevitably mean very considerable reductions of shorter-range nuclear weapons deployed alongside United States and Soviet ground and air forces on foreign territories in peacetime. If arms-control negotiations on strategic nuclear forces do not start from these assumptions, they will be doomed to political irrelevance.

Nuclear Weapons in Europe: How Few are Enough?

The change in the political landscape raises the question whether nuclear weapons are still needed in Europe: Should they have a future? And if so, how few are enough?

The most fundamental observation is that nuclear weapons have become a fact of life, whether we like it or not. One can abolish the nuclear "hardware" but the "software", that is, the knowledge of how to build the bomb, cannot be eliminated. Popular demands to ban nuclear weapons are not therefore a realistic proposition. "Living with the bomb", as Carl-Friedrich von Weizsacker put it some thirty years ago, remains the challenge we have to face up to. There is no easy answer to the question whether or not nuclear weapons have been the main contributor to peace and stability between East and West, and particularly in Europe, throughout the last four decades, but there can be little doubt that they changed the thinking of statesmen and military men on matters of war and peace very fundamentally. In a way, this is highlighted by the fact that an overwhelming majority of politicians in East and West readily subscribe to the notion of "common security", which is based upon recognition of the fact that there is no alternative to the prevention of war in the nuclear age.

However, even if the two super-Powers and their respective security alliances agreed that nuclear weapons were no longer needed for the prevention of war between the two sides, they could not dare to abandon their nuclear arsenals entirely. The sobering fact is that they may need a nuclear deterrent against the emerging nuclear/chemical-weapons Powers in the South. This task requires sizeable strategic nuclear weapons postures; low numbers would probably increase rather than lessen proliferation incentives. It is essential in this context that an integrating Europe reserve for itself the option of an independent nuclear deterrent through French and United Kingdom forces.

In sum, there is as yet no point at which it could be envisaged that the two super-Powers or France and the United Kingdom would be willing to scrap their strategic nuclear arsenals. Faced with the proliferation processes (nuclear and chemical weapons; ballistic missiles) outside the East-West context and the Chinese potential, it is highly unlikely that the United States and the Soviet Union would be willing to cut back their respective weapon inventories to "minimum" levels as proposed by some arms-control experts, for example to 500 warheads on each side.

Whatever may happen to NATO and the Warsaw Pact, Europe will certainly not become one large nuclear weapon free zone; nor is the end of nuclear deterrence in Europe in sight. Although the future of the Soviet Union is fraught with many uncertainties, the Soviet Union will remain a nuclear super-Power for some time to come. In fact, there is simply nothing that would back the Soviet claim to be a super-Power equal to the United States other than its impressive strategic nuclear inventory. Consequently, this is the one field in which efforts to modernise Soviet forces go on unabated. Possible strategic arms reduction agreements notwithstanding, a robust strategic nuclear posture provides the USSR with redundant intercontinental as well as regional nuclear options in Europe. The other European nuclear Powers are France and the United Kingdom, which are both in the process of expanding their strategic nuclear postures.

However, sub-strategic nuclear weapons in Europe are a different matter. At the core of the problem is the American nuclear presence on the continent.

In its "Comprehensive Concept of Arms Control and Disarmament" of May 1989, the Atlantic alliance reaffirmed its position

> "that for the foreseeable future, there is no alternative to the Alliance's strategy for the prevention of war, which is a strategy of deterrence based upon an appropriate mix of adequate and effective nuclear and conventional forces which will continue to be kept up to date where necessary. Where nuclear forces are concerned, land-, sea-, and air-based systems, including ground-based missiles, in the present circumstances and as far as can be foreseen will be needed in Europe."

This is indeed a cautious and flexible statement but nevertheless one wonders whether the Heads of State of NATO countries would still unanimously subscribe to this passage. What did the Alliance partners "foresee" when they signed the Comprehensive Concept in Brussels? Did they, for example, expect that *Solidarnosc* would take charge of the Polish government just a few weeks later? Did they give any thought to the possibility of democratic and peaceful revolutions in the German Democratic Republic, in Czechoslovakia and Bulgaria? Did they believe that the Berlin Wall would come down before the year was over? And did they think through the profound political and military-strategic consequences of all this a year ago? Certainly not. It is therefore not advisable to rely solely or primarily on the "Comprehensive Concept" when trying to define NATO's future nuclear requirements.

Traditionally, United States nuclear weapons in Europe are intended to contribute to Alliance security

> "by providing deterrence through retaliation, denial, and presence, and by reassuring... (the) allies of the U.S. commitment to Europe."

However, there has always been a potential for conflict between the deterrence function and the reassurance function of shorter-range nuclear weapons. During the recent modernisation debate in NATO this was highlighted by the— unfortunate—German saying, "The shorter the range, the deader the Germans". Since the INF Treaty destroyed the "escalation ladder" theory, politicians have come to view the remaining theatre nuclear weapons less as instruments for enhancing the credibility of escalation and the American strategic nuclear guarantee than as means to fight a limited nuclear war in Europe. Thus most Germans, on whose territory the bulk of United States shorter-range nuclear forces is deployed, obviously do not draw much reassurance from the presence of these weapons. Against the backdrop of the democratisation in Eastern Europe, the proposition that new, extended-range missiles would not necessarily fall on German soil (but rather on Poland, Czechoslovakia and Hungary) does not sell well either, as Foreign Minister Genscher emphasised repeatedly. The times where mere rumours that Washington might withdraw some of its many thousand European-based nuclear warheads made West European politicians very nervous are clearly gone.

Nowadays, the demand for political reassurance through nuclear presence is very modest indeed. Coupling the deployment of nuclear weapons to the United States conventional presence in Europe in the form of the familiar "No nukes, no troops!" equation does nothing, certainly, to increase the demand for nuclear reassurance in the current political environment.

However, it often tends to be overlooked that reassurance of Western Europe's non-nuclear States is closely linked to their participation in the Alliance's nuclear planning. The Federal Republic of Germany, for instance, has had considerable influence on the development of NATO's political guidelines for the use of nuclear weapons in Europe. But participation in planning requires a willingness on the part of the non-nuclear States to share nuclear risks and roles with the United States. From a United States point of view, the sharing of nuclear risks provides the basis for the extended deterrence-guarantee to Europe. Hence Uwe Nerlich's strong warning against efforts to confine nuclear deployment to the territory of nuclear weapon States:

> "This would be a complete reversal of interests and policies of non-nuclear weapons states. It would deprive non-nuclear weapons states completely of any critical role in the management of crisis and conflict. It would undo decades of evolution toward a deterrence system governed by control, self-restraint and participation."

The question is, how much politicians are prepared to pay for nuclear participation and extended deterrence if the possibility of armed conflict between East and West is deemed extremely low. NATO's recent debate on strategic nuclear forces has clearly shown that in a low-threat environment domestic considerations can easily prevail over the strategic-military calculus.

If we turn to the "pure" deterrence value of sub-strategic nuclear weapons in Europe, the picture is somewhat less confusing. Ironically enough, it is Robert McNamara who—unwillingly—presents a strong case for the retention of United States shorter-range nuclear weapons in Europe when he writes:

> "To the extent that the nuclear threat has deterrent value, it is because it increases the risk that nuclear weapons will be used in the event of war. The location of nuclear weapons in what would be forward parts of the battlefield; the associated development of operational plans assuming the early use of nuclear weapons; the possibility that release authority would be delegated to field commanders prior to the outset of war—these factors and many others would lead to a higher probability that if war actually began in Europe, it would soon turn into a nuclear conflagration."

Therefore, one could add, the presence of nuclear weapons in Europe serves to underline, in the minds of decision-makers in East and West, the tremendous, existential risks inherent in any clash of arms on the continent.

In the context of the impending conventional arms reductions in Europe, there are a couple of other arguments which support the retention of theatre nuclear forces in Europe.

First, conventional stability as the sole pillar of European security is a questionable proposition, all the more so since the eastern part of the European continent has entered the turbulent waters of profound change. At least for the Soviet Union, a resurgence of "old thinking" cannot be excluded. Furthermore, in a politically and technologically dynamic world, a once and for all assured conventional "structural incapacity for attack" is at least as improbable as an impenetrable missile defence.

Secondly, especially if one aims at radical reductions of conventional weapons and new, hitherto untested defence structures, nuclear deterrence can serve as a valuable stabilising element. The presence of nuclear weapons can strengthen the willingness of cautious leaderships to go ahead with far-reaching conventional disarmament.

Thirdly, the emergence of destabilising technologies and their military application can by no means be excluded. Until both—East and West—succeed in establishing an effective and reliable regime to curb the qualitative arms competition, nuclear weapons can serve as a hedge against destabilising technological breakthroughs.

The conclusion of these observations is that the presence of nuclear weapons in Europe is not only compatible with substantial reductions in conventional weaponry but a prerequisite of stability-oriented disarmament and restructuring. This is not to argue that Europe must cling to nuclear deterrence for eternity. It is simply too early to tell when and in what circumstances European security can safely do without the nuclear safeguard.

However, these observations do not lend themselves easily to recommendations as far as force-posturing is concerned. With the momentous political change in the East, Mikhail Gorbachev's unilateral military reductions, and a very promising agreement on the horizon concerning the reduction of conventional forces in Europe, it is extremely hard to make a convincing case for a certain sub-strategic nuclear posture: Are we, for instance, still operating under the

> "present circumstances of NATO's Comprehensive Concept as regards ground-based nuclear missiles? What good are new, ground-based missiles if they destroy whatever legitimacy is left for nuclear deterrence in the Federal Republic?"

Furthermore, to return to the initial question, how many nuclear weapons does the Atlantic Alliance need in Europe in the future? This numbers game is highly arbitrary, but there is clearly a tendency to arrive at ever lower figures. If the Supreme Allied Commander in Europe says he needs 2,900 nuclear warheads to do his job, some politician will appear on the public scene and declare that according to his own calculation, only 2,000 or 1,500 weapons are required. This of course will be contradicted by another politician or a civil expert who argues that some 500 warheads is the absolute minimum necessary for deterrence, and so on. It is impossible to keep track of all the figures and associated concepts that are floating around in public. This has long ceased to be a serious business. But where is the bottom line? Is there one? The main difficulty is that we are in a period of rapid change of the political parameters and assumptions on which military requirements need to be based. The speed and extent of this change are unprecedented since the Second World War. For instance, the military threat potential of the Warsaw Pact seems to consist now *de facto* of nothing more than the Soviet armed forces.

Another difficulty the Alliance is facing in sizing its future nuclear forces in Europe lies in the fact that it has long abandoned the notion of extensive nuclear war-fighting in favour of stressing selective strikes aimed at rapid war determination. This is clearly embodied in NATO's "General Political Guidelines" for the use of nuclear weapons in Europe. To calculate nuclear requirements for selective options intended to serve primarily (though not exclusively) political goals is distinctly more difficult than calculating requirements for extensive war-fighting options. However, it is relatively safe to say that NATO's present nuclear doctrine could do with hundreds rather than thousands of nuclear warheads in Europe. What has driven numbers up in the past was the "general nuclear response" role, that is, the missions of European-based nuclear weapons in an all-out nuclear war. Some analysts have convincingly argued that in the future this role should be left to strategic forces.

Towards Existential and Co-operative Deterrence in Europe?

It may well be inevitable that the Atlantic Alliance will arrive at some form of "existential deterrence" as regards the future United States nuclear posture in Europe— existential deterrence in the sense that NATO might eventually have to settle with a small and less than optimal sub-strategic posture which would act as a deterrent primarily through its presence in the European "war theatre", reminding decision-makers of the ultimate risk of armed con-flict rather than through its distinct and refined war-fighting capabilities. In a way, this process was already initiated with the INF Treaty.

In terms of hardware, the Alliance ought to acknowledge that the concept of replacing the aging Lance missile system with a new, ground-based nuclear missile is essentially dead. Barring a major policy reversal in the Soviet Union, it is highly improbable that any German government would accept new missiles on its territory at a time when Eastern Europe is turning democratic and the two German States are preparing for some new form of unity. Ground-based nuclear missiles have come to symbolise the nuclear threat as such for the German public.

However, NATO might manage to keep the old Lance system in place throughout much of the 1990s. Though the system's military utility would be very limited, it might nevertheless serve as a bargaining chip for arms control and provide an incentive to existential deterrence.

If sub-strategic nuclear weapons in Europe have a future, this will be the case mainly in the form of aircraft-deployed weapons. Aircraft have the advantage that they can strike beyond the potential battlefield area, that is Central Europe, and against the Soviet homeland. Thus they are the only weapons left in Europe that fit the requirements of NATO's "General Political Guidelines" for longer-range selective strikes against the potential aggressor. Owing to their poor penetrability into Warsaw Pact airspace, they would need to be equipped with stand-off weapons. These planes would be partly deployed on continental and United Kingdom air bases, as in the past, and partly on aircraft-carriers in the Mediterranean and in the Atlantic.

Nuclear-tipped artillery projectiles have a very short range (30 km maximum). If employed in case of war, they would explode exclusively on German soil. Yet up to now, the German public at large has not become very excited about these weapons, which are typically viewed as nuclear war-fighting means *par excellence.* Their deterrent value is often underestimated. Robert McNamara's description, cited above, of how deterrence works in Europe is, above all, applicable to nuclear artillery. The mere existence of hundreds of nuclear-capable artillery pieces on the forward edge of the potential battlefield heightens the risk of acts of conventional aggression. At the same time, nuclear artillery does conform with the notion of non-provocative defence much better than any other nuclear weapon system inasmuch as artillery—unlike certain missile systems—cannot be used for strategic-operational pre-emption. The modernisation of NATO's nuclear artillery shells has been going on for some time already. The most important feature of this modernisation programme is perhaps that the incoming new warheads (W 70 and W 82) are for the first time equipped with state-of-the-art electronic "permissive-action links" (PAL), which practically exclude unauthorised use of the shells.

However, the future of nuclear artillery in Europe is uncertain. Apart from special German sensitivities ("The shorter the range, the deader the Germans."), it is the prospect of major United States troop withdrawals from Western Europe that suggests quite drastic reductions in the field of nuclear artillery projectiles as well.

Some of the problems NATO is facing with respect to its nuclear weapons systems in Europe might be alleviated by new stationing schemes for the nuclear stockpile. If the warning time in Europe increases as a result of conventional disarmament and disengagement measures, then one can at least consider basing many or most of NATO's sub-strategic nuclear warheads in the United States. In the event of crisis they could be redeployed to Europe, provided that the necessary facilities and infrastructure were kept in place. Perhaps NATO could even create a "rapid nuclear deployment force" for Europe.

Whether a more or less deliberate shift towards existential deterrence in Europe would be acceptable to NATO, and in particular to the United States, is an open question, but there may simply be no alternative to such a development as the East-West conflict further recedes and new, comprehensive security structures evolve on the old continent. In such an environment French and United Kingdom nuclear forces would provide (existential) extended deterrence to their non-nuclear neighbours, even without any formal guarantees or promises.

However, NATO's nuclear policy is not independent of the Soviet Union's policy and posture. At present, the Warsaw Pact enjoys a significant numerical superiority over NATO in theatre nuclear weapon systems, particularly as regards ground-based ballistic missiles. But Soviet spokesmen have declared repeatedly that Moscow is ready to give up its superiority in strategic nuclear forces (SNF) arms-control negotiations with the West.

Moreover, Mikhail Gorbachev's statement on 6 July 1989 at the Council of Europe in Strasbourg and the Soviet-Finnish declaration of 26 October 1989 conveyed the message that the Soviet Union is open to compromise on the question of nuclear weapons in Europe and ready to abandon its former anti-nuclear rigidity. Although he does not admit it so openly, Mr. Gorbachev has obviously also abandoned his grand design for a nuclear free world by the year 2000. He now displays interest in the principle of "minimum nuclear deterrence" in Europe and has called upon the West to set up joint expert groups to discuss the matter thoroughly. This policy shift is only logical: if the USSR is prepared to give up its huge conventional preponderance in Europe and adopt a truly defensive military doctrine, it may want to rely more heavily on the nuclear safeguard for its security. The result of this may be a convergence of nuclear deterrence thinking in the West and in the Soviet Union.

This surely is a promising development and may open the way to some form of co-operative deterrence in the sense that both sides would agree to certain (low) weapon ceilings and modernisation schemes and the elimination of the most threatening nuclear systems. The resultant sub-strategic postures need not necessarily be symmetrical. That of course requires that discussions about minimum deterrence in Europe and future SNF negotiations not be limited to one or two weapon categories but rather follow a comprehensive approach. Whether and how far agreement on a co-operative approach can be reached is of course an open question. But at a time when a United States President can call his Soviet counterpart "partner in peace", there is reason for cautious optimism.

UNITED STATES TACTICAL NUCLEAR FORCES AND THE FUTURE OF DETERRENCE

Since the mid-1950s, the United States has developed and deployed a wide variety of nuclear weapons that are generally referred to as "tactical" or "theatre" nuclear forces (TNF). The Soviet Union, the United Kingdom, France and China have also fielded nuclear weapons systems that fit generally into this category, although they may have different designations for them.

In this article an attempt is made to examine the future role of United States TNF at a time when, over the next several years, the United States and its allies must make critical decisions about the modernisation of TNF and arms control. These decisions will be made in the context of a rapidly changing geopolitical environment, which is forcing all major States to rethink their national objectives and policies—a reconsideration that includes both the viability and the advisability of heavy reliance on nuclear weapons in Western security policy. The political changes in Eastern Europe and the Soviet Union over the past year, among other remarkable developments, suggest that we are moving into a new era of international relations. Projected developments in nuclear and conventional military technology may also be important, but technology does not seem to be the critical determining factor for future TNF requirements, as it was perhaps in earlier periods.

The first section of this article examines roles and requirements for United States tactical nuclear weapons that have emerged over the past 40 years, and the problems that have traditionally been associated with TNF. These requirements and problems are then used as the basis for identifying and assessing critical TNF issues that will confront the

United States and its allies over the next few years. Finally, several general conclusions are drawn about the most likely outcome of American and allied decisions concerning the future of tactical nuclear forces.

In our judgement, United States TNF—and those of other nuclear Powers—will not disappear in the foreseeable future. However, American (and Soviet) TNF will most probably decline significantly in numbers and types. The role of the remaining United States TNF will depend greatly on how the United States and its allies perceive the Soviet challenge, and on the degree of public support for a security policy which includes a TNF capability.

The authors would like to stress that this article is not intended to represent the policy of the United States Government. Where appropriate, in order to provide a context for the discussion, they have tried to spell out official American policy as they understand it, but the analysis and conclusions are those of the authors alone.

Traditional Roles and Requirements for United States TNF

The principal purpose of the United States armed forces, including its tactical nuclear forces,

> "is to secure our objectives and defend our interests by deterring aggression against the United States, its allies, and its interests. This requires that potential adversaries perceive that the costs to them of initiating aggression are likely to outweigh any benefits they might accrue",

The United States Government holds that deterrence, and not political or military advantage, is the ultimate American test of the value of TNF. To deter aggression, the United States has designed and deployed three general types of military power: conventional forces, short-range and intermediate-range tactical/ theatre nuclear weapons, and longer-range strategic nuclear forces. TNF are intended principally to form a link between conventional forces and strategic nuclear forces. Tactical nuclear forces help link the two by raising the prospect that local conventional or nuclear aggression against American forces overseas or against American allies may lead to retaliation by United States strategic forces. The use of TNF would be intended to deny the aggressor victory in a regional conflict, and to convince the aggressor that he faces strategic retaliation if he continues his attack. This United States and allied policy is known as flexible response. The deployment of TNF is *not* intended to permit the United States to fight and win a nuclear war limited to a theatre. Rather, TNF deployments enhance deterrence by making certain that a would-be aggressor cannot expect to wage conventional or theatre nuclear war without facing the prospect of further escalation. A limited conventional incursion, however, would be met by conventional forces only.

In performing this linkage function, United States tactical nuclear forces inevitably affect the interests of American allies, on whose soil or in whose territorial waters TNF may be based. The deployment of TNF must therefore reassure those allies of the seriousness and reliability of the American guarantee of their security—which guarantee is commonly known as extended nuclear deterrence, or the American nuclear umbrella.

To reassure its allies, the United States has taken steps to ensure that the North Atlantic Treaty Organisation (NATO) allies participate fully in deciding the number and type of TNF deployments, in the deterrent policies that govern the potential use of those weapons, and in any decision to use TNF. To support this American policy of reassurance the United States has agreed to supply tactical nuclear warheads to certain allies through programmes of co-operation. The United States maintains possession of these warheads during peacetime; during a crisis or actual conflict these weapons could be released to allies, who would then provide the actual system (for example, an aircraft) by which the weapons would be delivered.

Finally, TNF represent in some sense a deterrent and a counter to superior enemy conventional forces. American military officials have historically believed that in some circumstances United States conventional forces would be outnumbered in critical theatres—a weakness that might otherwise tempt a potential aggressor to attack. These officials do not believe that TNF can solve this military problem, and they do not consider tactical nuclear weapons to be an "ordinary" part of the United States and allied armed forces. Rather, the United States and its allies assume that possession of these nuclear forces immensely complicates an aggressor's planning and conduct of an attack, and raises the risks and costs of such a war for an aggressor correspondingly. To ensure their credibility, TNF do have military roles and missions, but these roles and missions are subordinated to the two political requirements (linkage and reassurance) discussed above.

In our judgement, the real-world functions of tactical nuclear weapons are considerably more ambiguous and controversial than this general account might suggest. There are a number of reasons for this ambiguity and uncertainty. First, and most important, the deployment of tactical nuclear forces has been and continues to be controversial among some allied Governments and their public. To the allies, American strategic nuclear weapons are, for the most part, far away. But TNF are often deployed on or near allied territory, and hence become targets for a would-be aggressor. If deterrence were to fail, the TNF of both sides might be used on allied soil. TNF may offer a degree of reassurance of the American commitment, but they also inherently raise the prospect of limited nuclear war and the actual use of nuclear weapons in wartime. The enhanced radiation-weapon controversy of the mid-1970s, the debate over the INF deployments in the early 1980s, New Zealand's refusal to permit the visits of United States Navy ships that might contain nuclear weapons, and the growing dispute in NATO over modernisation of the Lance missile are recent examples of these allied governmental and public concerns about TNF.

Secondly, the ways in which certain types of TNF are deployed raise serious questions among some analysts about whether or not those deployments are stable, that is, whether they conform to a set of political and military conditions that dampen tendencies towards war or violent change. It is suggested by some that the range and characteristics of specific TNF—for example, nuclear artillery shells and short-range ballistic missiles—would place pressure on the United States and its allies to use these systems before they were destroyed or captured during a conflict. During a crisis, such pressure to "use or lose" could theoretically prompt one side or the other to initiate hostilities or, if a conflict had broken out, to escalate the conflict when it might otherwise be stopped. The United States Government itself does not judge short-range TNF to be a likely cause of war or escalation, and we believe this judgement to be correct, but the United States and its allies have been interested in reducing any "use or lose" pressures that might actually exist.

There also exists the unlikely possibility of accidental or inadvertent use of nuclear weapons, or their capture by terrorists. The United States and its allies have taken very substantial precautions in this regard, including the use of permissive action links, commonly known as PALs. (Permissive action links are mechanical or electrical locking devices that prevent the use of the weapon without the explicit permission of proper political authorities.) The United States has also incorporated insensitive high explosives (IHE) into its new nuclear weapons designs. The use of IHE dramatically reduces the risk of accidental detonation of the high explosive in the weapon and thus of plutonium dispersal in the event of an accident or deliberate attack on the weapon itself. Western Governments continue to stress the importance of safety, security, and use control, and this emphasis is certain to affect future TNF policy and deployment decisions.

Thirdly, we note that throughout the period after the Second World War, the United States has limited the deterrent and military roles of TNF to large-scale attacks by the Soviet Union and its allies. The United States Government does not recognise such a limit in principle, but on the two occasions since 1950 when the United States engaged serious military opponents (North Korea and North Viet Nam), it did not resort to nuclear weapons. We believe this sets an important precedent for non-use of American nuclear weapons against non-Soviet Powers.

In short, the United States has assigned major deterrent functions to its tactical nuclear forces since 1945, and deterrence requires TNF to be capable of fulfilling certain military roles and missions. We observe, however, that the military roles and missions have often been overshadowed by political limitations and controversy. Will the next decade witness any major changes in the current TNF framework?

Critical TNF Issues and Decisions

Over the past decade, the United States and its allies have taken a number of important actions to support the requirements and adjust to the problems associated with TNF.

First, the United States, in conjunction with its allies where appropriate, has largely removed some TNF types from service—for example, atomic demolition weapons, air defence systems, some types of anti-submarine weapons. For the most part, these TNF systems were of older designs and had very short ranges. The United States pursued such a change in its TNF stockpile in part to reassure allies, who were growing concerned that these older, shorter-range systems did not serve properly to link allied conventional forces with American strategic weapons.

Secondly, in removing these systems, the United States and its NATO allies have unilaterally reduced the total number of TNF, while planning to modernise some of the remaining TNF stockpile. In 1979, as part of its decision to deploy the Pershing II and ground-launched cruise missile systems in NATO, the Atlantic Alliance decided to reduce its total nuclear stockpile unilaterally by 1,000 weapons. At Montebello, Canada, in 1983, NATO announced that an additional 1,400 nuclear warheads would be removed. These two reductions have resulted in the lowest NATO nuclear stockpile in Europe in twenty years.

The intent of this reduction process, among other goals, is to extend the range of the modernised TNF systems and thereby enhance the linkage aspect of tactical nuclear weapons. Extended ranges make it clear that it will be the aggressor's territory, and not that of the victim alone, that will suffer the consequences of aggression. Extended ranges will also help improve TNF survivability against enemy attack, and thus alleviate concerns about any "use or lose" pressures.

Thirdly, the United States reached an agreement with the Soviet Union for the first time on reductions in TNF (the INF Treaty). The INF Treaty eliminated all Soviet and American ground-launched ballistic and cruise missiles with ranges between 500 and 5,500 kilometres. Ironically, by removing these long-range TNF systems, the INF Treaty worked against the preferred United States and allied policy noted above, that is, the development of more survivable systems with longer ranges. Nevertheless, the precedent of the INF Treaty is an important one: TNF systems have now become an integral part of the larger arms-control process that includes conventional forces and strategic nuclear forces.

Will this pattern of TNF reduction, modernisation and arms control continue over the next decade? We believe that further TNF reductions, whether undertaken unilaterally or through negotiations, will almost certainly take place. The outcome of any TNF modernisation is much more problematic. The most controversial decision in this regard will concern the proposed modernisation of NATO's Lance ballistic missile, which has been deferred by the Alliance until 1992. The continued deployment of nuclear artillery shells, and any subsequent upgrades to these systems, is another controversial subject because of their extremely short range. Finally, the United States and its allies must determine whether to deploy the proposed air-launched tactical short-range attack missile (SRAM-T). The continued deployment or modernisation of each of these TNF systems will depend heavily on United States and allied assessments of how well they support linkage and reassurance—as well as on further developments in Eastern Europe and the Soviet Union.

We note that the United States military, and especially the various regional and functional Commanders-in-Chief, will be very strongly represented in any decision about which TNF systems to retain in the

United States stockpile. In their recommendations about TNF, the Commanders-in-chief will weigh heavily the national policy-makers' assessment of the threat and the specific military missions that are required of them.

Overshadowing all of these deployment/modernisation decisions is the ongoing arms-control process relating to conventional forces in Europe (CFE) and the proposed negotiations on short-range nuclear force (SNF). The conventional and nuclear balance in Europe could be altered dramatically as a consequence of these negotiations, thus necessitating major changes in the TNF stockpile.

This brings us to an important point: we believe that the future of TNF will be determined primarily by the rapidly changing political and strategic environment, rather than by particular decisions to deploy or retire specific tactical nuclear systems. A number of such political changes are noted below, along with a brief discussion of the evolution of military technology and operations.

Qualitative Changes in the East-West Conflict

A major part of the changes that can be expected in the international environment is due to potential shifts in Soviet goals and policies, and to the dramatic political changes we have recently witnessed in Eastern Europe. There are great uncertainties about the ultimate course and outcome of Gorbachev's reforms, but in all probability, the Soviets will be preoccupied with their own economic revival for much of the next thirty years, and could well pose less of a global military threat to Western security.

A substantial decline in the Soviet military threat would have important implications for TNF. TNF were deployed in the first instance to compensate for local Soviet conventional superiority and thereby to enhance deterrence. If this superiority were no longer to exist, much of the military rationale for TNF would not necessarily disappear, however, because (a) TNF would still represent an important linkage between conventional and strategic forces; *(b)* it has been historically difficult to ensure deterrence with conventional forces alone; and *(c)* the Soviet Union, with its inherent geostrategic advantages on the European continent, could again constitute a major threat to Western security, over either the short term or the longer term.

The context within which TNF systems are deployed in Western Europe could also change significantly if the Soviet Union removes its military forces, including its TNF, from Eastern Europe. This Soviet withdrawal, which seemed inconceivable only a short time ago—and it is by no means certain even today—would require all of the NATO allies, including the United States, to re-think entirely their military force structure and planning. We cannot predict the outcome of such a re-evaluation on the future of TNF, other than to observe that it would tend to weaken the political rationale for the deployment of United States TNF on the European continent itself.

A New Strategic Environment

For the past forty years, the structure of international relations has been dominated by a bipolar pattern of competition between the United States and the Soviet Union. Over the next several decades, the international system is likely to be marked by a continuing evolution of the international system away from the bipolar pattern. Part of this evolution will occur because of the projected improvement in Soviet-American relations. But regardless of the state of United States-Soviet relations, other nations will continue to enhance their power relative to that of the United States and the Soviet Union, and these nations will increasingly have the capability to assert their own interests.

We do *not* believe that the emerging international system is likely to become "multipolar" in the nineteenth-century sense, where five European Powers were considered to be of the first geopolitical rank. The international system of the early twenty-first century might more appropriately be characterised as "multi-power" or "multi-dimensional", wherein the major States interact and compete on more equal terms over an increasing range of issues. There will, however, continue to be important disparities among nations in terms of technological, political, economic and military strength.

Over this period, we think that the United States is likely to place relatively greater emphasis on threats to its national security other than those posed by Soviet military aggression. This shift in United States defence priorities would come about in large part because of the current and projected reduction in the Soviet threat. But in addition, the United States (as well as the other major Powers) is becoming increasingly aware of the need to maintain security through its general economic and technological competitiveness. Nations can also be expected to face serious environmental and health problems throughout the twenty-first century. Issues such as the global warming trend, the international debt, and AIDS may expand the political agendas of many States perhaps supplanting to some extent the more military-oriented concerns that have marked the era following the Second World War.

What implications do all these changes in the international environment have for the future of tactical nuclear weapons? Arguably, nuclear weapons of all kinds were an integral part of the post-war bipolar order, where they were used to deter global conflict between two well-defined adversaries. Nuclear weapons may be expected to play a different role in a more complex. multi-Power international environment, however—depending in part on the extent to which other potentially hostile nations (besides the Soviet Union) develop nuclear weapons and sophisticated delivery systems. In any case, because of this greater international complexity and uncertainty, American national security policy will likely place the general political concept of stability at the top of its list of objectives. The United States and allied interest in stability will tend to place even more serious constraints on where TNF can be deployed and on the deterrent policies associated with them.

The Evolution of United States Alliances

In our judgement, the formal United States alliance system is likely to change over the coming decades to account for alterations in relative power among the members, emerging allied interests outside the United States-Soviet competition, and changing threat perceptions. If deterrence of Soviet military aggression ceases to be the prime object of critical United States alliances—it will probably remain an important objective—then the requirements for TNF may decrease correspondingly.

The degree of any contraction of TNF roles will depend primarily on whether (and how much of) a military threat from a hostile Power is perceived by these alliances. In any event, as their relative power grows, United States allies may be inclined to emphasise those weapons systems that are under their direct control. In some cases, this may lead to further nuclear proliferation. At the other extreme, it is conceivable that some nations could make their adherence to a United States alliance conditional on that alliance's being explicitly non-nuclear in character.

Although the changing character of the United States alliance system may reduce the need for TNF, we believe that some level of American nuclear weapons will still provide the United States with an essential measure of political and military support for its allies. Assuming the allies do not perceive an immediate and severe military threat, however, any American nuclear guarantee will tend to be regarded more as an insurance policy than as a primary means of security. Such an insurance policy will be enhanced by a nuclear force that is neither "present" nor "threatening" in peacetime, but which is perceived politically as providing linkage to United States strategic nuclear forces if circumstances warrant. This approach may cause the United States to emphasise tactical nuclear forces that are based in the United States or at sea, as opposed to forward-deployed TNF.

New Political-Military Contingencies

The bulk of United States TNF requirements, in terms of numbers and types of systems, has been driven largely by the American commitment to deter Soviet aggression against Western Europe. The European theatre may cease to be the principal focus of the United States military over time, however, if East-West relations continue to improve and as the nature of the United States alliance structure evolves. To be sure, Europe will undoubtedly remain of vital political interest to the United States for the indefinite future. According to United States Secretary of State James Baker:

> "America's security—politically, militarily, and economically—remains linked to Europe.... As President Bush stated in May [1989], the United States is and will remain a European power."

In the context of this firm commitment, however, it is our view that the direct American military contribution to European security may be substantially reduced over time.

We also assume that the United States will remain committed to ensuring the security and independence of other regions that are deemed vital to its security (Middle East/ south-west Asia, western Pacific/ north-east Asia, Caribbean Sea/Central America). In addition to any potential challenge from the Soviet Union in these regions, the United States must take into account the fact that a number of rising nations, some friendly with and others hostile to the United States, can be expected to acquire substantial quantities of advanced weapons and the means to deliver them accurately over long ranges. These Powers can also be expected to acquire chemical, or even biological, weapon capabilities, and in some cases nuclear weapons. The United States will accordingly be interested in developing a policy and force posture that anticipates and seeks to deter the use of nuclear weapons (and other weapons of mass destruction) by non-Soviet Powers. Such a posture may or may not require nuclear weapons, however.

Arms Control

The conclusion of the INF Treaty, and the prospective completion of the CFE and START agreements, have raised questions about the future of the remaining nuclear forces of the NATO alliance. President Bush announced in May 1989 that the United States would engage in short-range nuclear force (SNF) negotiations with the USSR as soon as a CFE agreement was concluded. He indicated that reductions in NATO SNF should be undertaken only when Soviet advantages in conventional forces are removed or significantly reduced.

If conventional arms control, together with unilateral measures, can truly establish a non-nuclear balance where it is much easier to defend than to attack, then the military roles and missions for United States nuclear weapons in theatre warfare may be quite different, and possibly much less, than in present circumstances.

There may well be good reasons for retaining tactical nuclear weapons even if an improved military balance of conventional forces can be brought about. Among other considerations, it is difficult to define a stable conventional balance, and even more difficult to keep it so. Nevertheless, negotiated TNF reductions will seem more attractive if Western confidence in the resilience of the conventional force balance grows.

The long-term future of United States-Soviet TNF arms control may depend in large part on the actions of other States. For example, neither the Soviet Union nor the United States may be willing to eliminate or reduce specific types of TNF if other nations are free to deploy the same types of weapons or delivery vehicles without restriction. Or the super-Powers may be confronted by nations that are determined to close themselves off from the East-West nuclear competition through the establishment of nuclear free zones, the banning of nuclear-armed and nuclear-powered ships from their ports, and the like.

Public Opinion

Over the past decade or so, segments of public opinion in key nations—West, East and non-aligned—have demonstrated increased scepticism about the morality and practicality of nuclear deterrence. This "delegitimisation" of nuclear weapons might be defined as reduced public confidence in the reliability and safety of nuclear deterrence arrangements, and lessened certainty about the prudence, strategic necessity, and moral legitimacy of posing nuclear threats to adversaries.

This scepticism about nuclear deterrence is by no means universal. The United States and allied Governments maintain the position that nuclear deterrence represents an essential part of their security policies, and even many critics of present Western nuclear policy would not reject the concept of deterrence altogether. Nevertheless, as resistance to the concept of deterrence has become more widespread, the United States and its allies have found it increasingly difficult (although not impossible) to make and implement decisions about nuclear force modernisation and arms control. The public controversy over the enhanced radiation weapon (neutron bomb), and over the INF deployments in the late 1970s and early 1980s are examples of this problem for Western Governments."

Changes in Military Technology and Operations

Partly because of these political pressures, and partly because of the favourable trends in the international environment, American policy-makers are unlikely to be interested in deploying TNF systems with significantly more advanced military characteristics. There are several potential evolutionary developments that might otherwise be explored. For example, it is possible to develop very-low-yield nuclear weapons that, combined with very accurate means of delivery, could cause relatively less incidental damage than current weapons. Other concepts envisage the use of nuclear systems with enhanced amounts of specific weapons effects, such as electromagnetic pulse (EMP) or microwaves. These special output devices would be designed to disrupt or destroy enemy communications and sensor systems.

As opposed to these potential military improvements in TNF, the United States and its allies are much more likely to continue to emphasise programmes aimed at increasing the safety, security, command and control features of new and upgraded nuclear systems. Such measures could include the application of even more sophisticated PALs; the addition of optical logic systems to complement existing mechanical and electrical safety devices; and even the separation of fissile nuclear material from the rest of the weapon.

Conceivably, some (though certainly not all) military roles that have previously been assigned to nuclear weapons will be allotted to future advanced conventional systems. Improvements in key non-nuclear technologies, especially sensors, computers, and communication networks, and in munition accuracy and lethality, will be essential to this process by making it easier to identify, attack and destroy enemy targets. In any case, TNF will continue to have a unique political and psychological value for deterrence as compared with conventional systems.

Conclusions

Given the considerable uncertainties that exist concerning the future political, fiscal, military and technical environment, any projection about the long-term future of theatre nuclear weapons in American and alliance security policy must be made cautiously. Nevertheless, we offer several observations for consideration, not to predict future United States or allied TNF policy, but to provide an assessment of where current political and military trends may take us over the next decade or so.

The United States can be expected to maintain a TNF stockpile for the foreseeable future, but the number and types of deployed TNF will probably decline owing to political pressures and technological developments in conventional and nuclear weapons systems. These TNF reductions can be expected even in the absence of a formal arms control agreement, although the pace and nature of a TNF draw-down might be quite different if it is done unilaterally or in tacit conjunction with a Soviet TNF reduction.

Political criteria for TNF deployments will continue to overshadow military or technical requirements. There is a very real question to what extent political circumstances will permit modernisation of the remaining United States TNF stockpile. This is a serious issue, given the considerable age of many existing systems, which must be replaced, upgraded or retired. The most likely candidates for this process of attrition are nuclear artillery shells, short-range ballistic missiles, and naval tactical weapons. Air-delivered systems, especially stand-off weapons, are the most likely to be deployed and retained. In some cases, advanced, long-range conventional weapons systems could be employed for missions that are now thought to require TNF—especially against fixed targets such as enemy command posts. The United States military tends to be sceptical about the capability of advanced conventional munitions to replace TNF for many tactical missions in a large-scale conflict.

With respect to future TNF characteristics, the United States will continue to give highest priority to safety and security. The survivability of TNF systems will also be rated highly. Technologies that might significantly enhance military effectiveness will receive less priority. Potential new TNF capabilities (for example, low-yield, special output) are not likely to be seriously considered in the present climate. Such capabilities might become more attractive to American leaders, however, if the United States pursued a more unilateral national security policy, one that is less affected by alliance political constraints, or if the international environment became considerably more hostile.

The United States choice as to which TNF systems to retain may be significantly affected by increasing restrictions on the deployment of nuclear forces aboard ships or on allied territory. American choices may be further restricted by the growth of nuclear weapon free zones that cover land, territorial waters and airspace, and by the attitudes of allies and other nations. This suggests that the United States may prefer to design long-range strategic nuclear (and conventional) forces that can be used for "tactical" purposes. The remaining American TNF might be based in the United States (especially for air-delivered systems) or on naval platforms that do not require overseas servicing.

Given the potential nuclear (and other types of) proliferation, the United States may at some point be required to reconsider the deterrent requirements for its TNF in third world contingencies. The United States will obviously wish above all to deter such attacks. Nevertheless, the United States must think through how its force structure and operations should be configured for conflict in a regional theatre where one or more nations possess nuclear weapons, as well as how it should respond if nuclear deterrence fails. At the same time such contingency planning need not involve nuclear weapons.

To sum up: the traditional American and allied conception of the deterrent role of tactical nuclear forces—linkage, reassurance, military effectiveness—will probably change substantially over the next decade. The ultimate outcome of this process of change will depend principally on the degree to which the Soviet challenge to Western security is moderated, and on the ability of Western Governments to articulate to their publics the need for nuclear deterrence in a vastly changed international environment.

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DOCTRINES AND STRATEGIES CONCERNING NUCLEAR WEAPONS

A. General

Military doctrines are developed basically to determine the conditions under which force would be used and as guidelines for force structuring and war plans. Throughout history military doctrines have changed considerably, reflecting changes in perceptions, the evolution of the international environment and the development of different means of warfare. Similarly, various military doctrines relating to the use or threat of use of nuclear weapons have been continuously revised over the past 40 years in conjunction with the changes in the nuclear potentials of the major powers and the rapid technological developments in the field.

The concept of deterrence is as old as the phenomenon of war. Doctrines of deterrence basically seek to influence the decisions of the opposing side. Thus, they rest on the perceptions of the State(s) being deterred. Such a State must be convinced that the other side has at its disposal the military means to support its doctrine and furthermore that there is a "sufficient" likelihood that it would implement it. Generally, deterrence is based on the threat of use of force to prevent someone from carrying out certain hostile acts.

In the nuclear age, however, the notion of deterrence has acquired totally new dimensions. The overwhelmingly destructive power of nuclear weapons has given new potency to the deterrence posture of the nuclear weapon States. Nuclear deterrence by the threat of massive destruction is based on the idea that if one nuclear -weapon State launches an attack on another nuclear weapon State, the defender will have sufficient force left after the attack in order to be able to launch a retaliatory strike that would inflict unacceptable damage on the aggressor. Thus, according to this concept, the aggressor would be dissuaded from initiating an attack. The question of nuclear deterrence takes on particular significance at the regional level with respect to those States which reportedly possess nuclear warheads or nuclear explosive devices and which, at the same time, are not parties to the Treaty on the Non-Proliferation of Nuclear Weapons. It relates also to the possibility that nuclear weapons could be used to threaten and endanger the security of a region and of neighbouring States, creating for them the need to devise appropriate security arrangements on which they can rely

Several fundamental issues have been debated more or less since the inception of the nuclear age. One is whether nuclear weapons are indispensable for an effective deterrence. Another is whether they can deter conventional attack or only nuclear attack. Major uncertainty also surrounds critically important questions under what circumstances a certain State would in fact use its nuclear weapons. In this connection, there are those who believe that one cannot say with assurance that reality will unfold according to expectations based on the existing doctrines and that one cannot disregard the possibility of events developing independently of the professed doctrines.

Other issues raised are whether or not a nuclear weapon State can credibly extend nuclear deterrence to its allies (“extended deterrence”); whether an assured retaliatory capability is sufficient for deterrence (“minimum deterrence”) or if this calls for larger and more varied forces, i.e. a “war-fighting” capability; and, finally whether deterrence in reality rests on the mere existence of powerful nuclear arsenals (“existential deterrence”). If that is the case, even quite large differences in the size of the arsenals, as well as refinements in technology and employment concepts, would be largely irrelevant. The question still remains as to how much and what type of nuclear weaponry are sufficient for deterrence. In the view of many, this has, in the past, led to an arms race resulting in excessive nuclear arsenals.

Different States assess nuclear weapons and deterrence differently. There are those who believe that nuclear deterrence has played an important role in preventing the outbreak of a world conflict and that nuclear deterrence will continue to be a prerequisite for international stability and world security for the foreseeable future. Others consider that the risks of *a* failure of deterrence are too high to be worth taking, since nuclear war could cause intolerable destruction in any part of the globe, no matter how distant from the centre of conflict. They believe that nuclear weapons should be banned and abolished and that viable security alternatives must be considered on the basis of broad multilateral co-operation rather than on a permanent adversarial relationship.

The views on nuclear weapon doctrines, including deterrence, are described briefly in section D of the present chapter. More detailed discussions are presented in the United Nations Study on Deterrence. The five nuclear weapon States have submitted, for publication in the present study, short descriptions of their doctrinal views on the use of nuclear weapons.

The following section describes briefly the main features of the nuclear doctrines of the nuclear weapon States. These doctrines have historically evolved and there has also been a fair amount of interaction between different doctrines, either through the process of negotiations on arms limitation or through changing perceptions of threats to the national security of those countries. A great deal of the evolution of and interaction between doctrines may be attributed to developments of weapon technologies.

B. Doctrines of the Nuclear Weapon States

1. United States of America

Although it was recognised in the United States during the immediate post-war years that the atomic bomb might potentially change all military strategy, no particular doctrine had emerged at that time for the use of this weapon. The bomb was viewed mainly as a somewhat bigger weapon to be used in the same way other bombs had been used. By 1948, strategic air strikes figured prominently in United States Air Force nuclear war planning.

At the end of the 1940s and the beginning of the 1950s, under the impact of the changing world situation and the development of the Soviet Union's nuclear capability, a re-evaluation of American defence policy was begun, which affected both the level of nuclear armaments and military doctrine. The United States Strategic Air Command, which had been given overall responsibility for target planning for nuclear weapons use, recommended that, owing to the small size of the available arsenal and the paucity of reliable intelligence on Soviet infrastructure targets, counter-city nuclear strikes would be militarily more effective than attacks on the energy and transportation infrastructure. The Korean War had prompted a major US military effort and President Truman authorised an expansion of nuclear weapons production. The United States stockpile rose from 50 in mid-1948 to about 1,000 in 1953 and reached almost 18,000 by the end of the decade.

At the doctrinal level, in 1954 the United States Secretary of State, John Foster Dulles, announced what was referred to as "the doctrine of massive retaliation." The United States, according to Dulles, reserved the option of retaliating instantly, "by means, at times, and at places of our choosing". That declaration was said to be intended primarily to underscore the preventive nature of the nuclear threat. It did not imply that the United States would automatically bomb the industrial or population centres of an adversary in the event of an attack on the United States or its allies. The United States would not necessarily have to meet military action where it occurred, but might instead respond, with or without nuclear weapons, with attacks on strategic targets.

The first Soviet thermonuclear test in 1953 and the launching of the first Soviet Sputnik in 1957 made it clear that the United States could be exposed to nuclear strikes. This put an end to the idea of the traditional "Fortress America" and also prompted re-evaluation of the doctrine of "massive retaliation". The question was raised: if there was to be some lower level of conflict involving the Soviet Union, should the only available United States response be all-out war, particularly when it could mean mutual suicide?

The need for a revised strategy was recognised by President Eisenhower and further addressed by the Kennedy Administration. Two developments took place. The first was the adoption of the single integrated operational plan (SIOP), which sought to coordinate nuclear planning and delivery between the various American armed services. Secondly, NATO's conventional forces were strengthened, presumably to avoid as long as possible recourse to nuclear weapons. The introduction of tactical nuclear weapons in the late 1950s and the emergence of the concept of limited nuclear warfare were two convergent factors of readjustment at the level of military doctrine.

The resulting NATO doctrine took the form of the concept of "flexible response". It was put forward in the beginning of the 1960s by United States Secretary of Defense Robert McNamara. "Flexible response" presumed that NATO would maintain its standing conventional forces at a level at which it could withstand attack by the Warsaw Treaty Organisation until reserves were mobilised. Nuclear weapons would be used only if the West faced defeat in a conventional war. This required the existence of flexible and effective conventional forces, if necessary supported by tactical nuclear weapons and ultimately by strategic forces. The doctrine stated that each case of aggression would be dealt with independently and American nuclear response could be controlled for varying levels of response to aggression.

A retaliatory response could be as small as one tactical nuclear charge or as large as a multi-target strike on the Soviet Union. Thus, the Soviet Union would be deterred from attacking since a conflict would run the risk of escalating to an all-out nuclear war. The United States would deploy its nuclear forces in a structure and in sufficient numbers to enable it to ride out a possible first strike by the Soviet Union and then retaliate with enough nuclear forces to destroy one fifth to one fourth of the Soviet population and one half to two thirds of the Soviet industry ("assured destruction"). Secretary of Defense McNamara also initially proposed a counter-force strategy. A counter-force attack is an attack aimed at an adversary's military capability, especially its nuclear forces; a counter-value attack is directed against an opponent's civilian and economic centres.

However, the technically feasible options of the time offered limited possibilities of reaching and concentrating on military targets. With further technological developments this option gained in importance.

The problem of developing credible options was again elaborated by the Nixon Administration, which sought to create a set of "limited nuclear options" and thus enhance in-conflict escalation control. According to some sources, in 1974 a plan was outlined for the employment of nuclear weapons in a way that would allow the United States to "conduct selected nuclear operations". This approach was reportedly reconfirmed and further developed by the Carter Administration, although Secretary of Defense Harold Brown stressed that "assured destruction" continued to form the "bedrock" of nuclear deterrence. The improvements in the accuracy of missiles and in command and control facilities during the past two decades have stimulated interest in the concept of "selected nuclear operations" and nuclear war-fighting.

In 1982, the States parties to the North Atlantic Treaty reaffirmed in a Declaration that none of their weapons, nuclear or conventional, would ever be used except in response to attack.

Perhaps the most significant doctrinal development in the 1980s was the United States' initiative for developing a system of strategic defence (SDI). Basically, the proponents of the idea are endeavouring to deter aggression by denying a potential adversary the certainty that his nuclear strike would succeed. They believe that deterrence would thus become more defensive and less nuclear.

2. The Soviet Union

After the Second World War, although the Soviet Union was aware of the potential of nuclear weapons, this did not seem to have much effect on its military doctrine. Nuclear weapons were treated simply as bigger explosives.

In 1960, the Chairman of the Soviet Council of Ministers, Nikita Khrushchev, announced that a new branch of the Soviet military forces had been formed—the strategic rocket, forces. He also announced that the conventional forces would be reduced or replaced, because nuclear weapons "had made it possible to raise our country's defensive power to such a level that we are capable of making further reduction of our military forces".

In 1961 Defence Minister Malinovsky stated that one of the most important points of the Soviet military doctrine was that a world war—if initiated by an aggressor—"inevitably would take the form of a nuclear missile war." This was an indication that the concepts of deterrence and massive retaliation began to play an important role in Soviet thinking at the time.

These and other statements were followed in 1962 by the publication in the Soviet Union of a comprehensive work on military strategy edited by Marshal V. D. Sokolovsky, which recognised the revolutionary impact of the appearance of nuclear weapons on military strategy. One central thesis in this work was that a war where the two major powers were involved would inevitably escalate to a general nuclear war:

> "It should be emphasised that, with the international relations existing under present-day conditions and the present level of development of military equipment, any armed conflict will inevitably escalate into a general nuclear war if the nuclear powers are drawn into this conflict."

Based on this assumption, the Soviet Union attempted in parallel to build up its strategic nuclear forces creating an ability, if necessary, to deliver a credible strike in case of war.

When the concept of "flexible response" was adopted by NATO in 1967, the Soviet views on total nuclear war also started to change gradually. Nuclear weapons were still depicted as a decisive element of war, but it was maintained that only with conventional combined arms operations could the war be won. Beginning in 1965-1966, the Soviet Union apparently began to consider that nuclear war could remain geographically limited. The new edition of Marshal Sokolovsky's work on military strategy supported an increasingly flexible view of the use of nuclear weapons, thus indicating possibilities other than simply massive strategic retaliation:

> "In working out the forms and methods for conducting a future war, an entire number of questions should be considered: how will the war be unleashed, what character will it assume, who will be the main enemy, will nuclear weapons be employed at the very start of the war or in the course of the war, which nuclear weapons—strategic or only operational-tactical -where, in what area or in what theatre will the main events unfold, etc."

Eventually, Soviet doctrine underwent further changes. It subsequently held that a war would not inevitably become nuclear. Thus, the Soviet military writer Colonel-General A. S. Zjoltov wrote in 1972 that "it is completely possible that a war can be conducted with only conventional weapons." He said that war without nuclear weapons was possible; even if nuclear weapons were used, these weapons could not solve all military tasks; the use of nuclear weapons against some targets might prove not operative; nuclear weapons could under some circumstances be an obstacle for the advancement of a country's own forces; and that many conventional weapons could be used with great effect against the nuclear weapons of an enemy.

In 1976, it was stated on the highest level in the Soviet Union that "if all presently accumulated nuclear stockpiles were used, humanity would be totally destroyed". In 1981, the Soviet Union announced that victory in nuclear war would be impossible, a sentiment it has expressed ever since. In 1982, the Soviet Union officially declared that it would not be the first to use nuclear weapons in any conflict. It stated that it would not seek to use nuclear weapons since any use, no matter how limited, could lead to escalation to all-out nuclear war. Nevertheless, the Soviet Union continued the expansion of its strategic nuclear forces, which, according to the Soviet Union, took into account the need to ensure their survivability.

The Declaration adopted in 1987 by the Soviet Union and other States parties to the Warsaw Treaty Organisation envisaged a new alliance military doctrine subordinated to the task of preventing war, whether nuclear or conventional. Military means to resolve any disputes were said to be inadmissible in the nuclear age. The Declaration pointed out that the defensive nature of their military doctrine resided in the undertakings of the Warsaw Treaty States that they: (a) would never, under any circumstances, initiate military action unless they were themselves the target of an armed attack; (b) would not be the first to use nuclear weapons; (c) did not have any territorial claims to any other State; and (d) did not view any State or any people as their enemy.

Despite the significant improvements in the international situation and in Soviet-American relations, the Soviet Union considers that it has to take into account in its defence structure, including its strategic arms structure, the considerable military potential of the United States and NATO. For the strategic nuclear forces of the Soviet Union, the essence of defence sufficiency is determined by the need to maintain those forces in such quantity and quality as to provide reliable retaliation capability against nuclear attack upon it in any circumstances, even the most unfavourable. The Soviet Union maintains that it does not seek military supremacy over the United States and does not lay claim to greater security, but at the same time it is fully resolved not to allow the latter to gain military supremacy over it.

The Soviet Union believes that the strategic balance that has developed between the nuclear forces of the USSR and those of the United States, both in the overall quantity of strategic nuclear weapons and in their real operational potential, makes possible in any circumstances to inflict unacceptable damage on the aggressor in a retaliatory (second) strike. The Soviet Union has stated that it is in favour of curbing the nuclear arms race through the contractual lowering of the levels of nuclear weapons. In reducing strategic nuclear weapons, emphasis should be placed on enhancing strategic stability through strengthening their invulnerability while reducing their overall quantity and thus retaining these weapons as effective means of retaliation but not of attack (first strike).

3. The United Kingdom

The United Kingdom remains fully integrated in NATO. As a member of NATO, the United Kingdom is covered by the United States' extended deterrence. Even though the United Kingdom's nuclear forces are committed to NATO's policy of flexible response, the United Kingdom's possession of its own nuclear weapons gives it an option to initiate independently a nuclear response to attack. These two roles would complicate the strategic responses of a potential aggressor.

Although the United Kingdom's Lance tactical nuclear missiles are under a dual-key system with the United States, its other forces are controlled by the United Kingdom alone. British nuclear weapons are deployed both on British soil and in the Federal Republic of Germany. During a European conflict and where British nuclear weapons were to be used as part of NATO forces, the Supreme Allied Commander in Europe, an American, needs British approval to order the use of British nuclear weapons.

British strategic doctrine is based on what is commonly known as minimum deterrence. In view of the relatively limited number of strategic warheads at its disposal, at present some 128, the doctrine is presumed to be almost purely counter-value.

Most of Britain's forces are targeted on the Soviet Union. In 1962 Britain dedicated its Polaris force to NATO as a strategic deterrent to publicly underline the focus of its nuclear forces. The United Kingdom's strategic nuclear forces ensure that it could "inflict a blow so destructive that the penalty for aggression would have proved too high."

4. France

Along with the process of withdrawing its military forces from NATO control in 1966, France was developing the essentials of its autonomous national doctrine of nuclear deterrence. France maintains an independent nuclear force, since it believes such a force to be essential for its defence and independence.

France's nuclear strategy is one of dissuasion du faible au fort, or the weak deterring the strong. Deterrence and security rest on the threat of nuclear retaliation against a conventional or nuclear attack on France.

According to French declarations, if France felt its vital interests were threatened, it would launch a nuclear "last warning" toward the attacking State. Should the aggressor persist in his actions, this shot would be the precursor of a devastating nuclear attack against France's opponent. Since France's nuclear doctrine is well publicised, the purpose of the ultimate warning would be that the attacker could then determine that the benefits gained by pursuing the attack on France would be far inferior to the costs incurred by doing so.

Originally, French nuclear strategy was defined as being aimed at defending French territory. Subsequently, France indicated that it was aimed at defending the vital interests of France. France stresses that the decision to use its nuclear weapons can, by definition, only be made on the sole basis of its national sovereignty. To fulfil its nuclear strategy, the French triad ensures a survivable second-strike capability that is seen as reducing the likelihood of a pre-emptive strike against France.

5. China

When China first acquired a nuclear weapon capability, it announced that China would never be the first to use nuclear weapons, and would not, in any circumstances, use nuclear weapons against a non-nuclear weapon State. However, China's nuclear weapons employment strategy remains largely unknown.

China's defence policy was based for many years on the concept of a "people's war" on the one hand and nuclear deterrence on the other. In the 1960s the people's war concept dominated. According to Mao Zedong, an attack on China, whether nuclear or conventional, would have to be followed by an invasion of ground forces, and this is where the supremacy of the concept of the people's war would be felt. Hostile forces would be lured deep into China's territory, "bogged down in endless battles and drowned in a hostile human sea."

As a result, the Chinese seemed to have opted for a minimal nuclear deterrent. In addition, in spite of a renewed emphasis on its regular military forces, China continued to promote the idea of "peasant armies", which, owing to their size and dispersal, could not be wiped out by nuclear attacks. The Chinese force structure supporting its nuclear doctrine, however, was reported to be pragmatic and flexible.

During the last years of the 1970s, it seemed that the adherents of the concept that in war men are more important than weapons had lost ground. Furthermore, there were indications that efforts were under way to develop more modern general-purpose forces in order to meet more limited military contingencies than the extremes of nuclear deterrence or mass war. There were also indications that China was interested in developing tactical nuclear weapons.

It appears that currently in China, the modernisation of existing nuclear weapon systems takes precedence over a dramatic quantitative build-up of nuclear forces.

C. Relationship between Nuclear Weapons, Non-Nuclear Weapons and Deterrence

The relationship between nuclear and non-nuclear weapons and its impact on military doctrines is crucial to an examination of the concept of deterrence.

The discussion regarding this relationship has centred chiefly on the situation prevailing in Europe where the two military alliances, NATO and the Warsaw Treaty Organisation, have over the years faced one another with a large concentration of forces, both nuclear and conventional. Notwithstanding this concentration on Europe, similar points could be drawn in relation to the Sino-Soviet nuclear balance and indeed to maritime strategy in the Pacific.

On the NATO side, the perceived superiority of the Soviet Union and the Warsaw Treaty countries with regard to conventional forces has long been a focal point of a debate on the overall balance of forces, including the role of nuclear weapons in the maintenance of a credible deterrent posture in Europe. The doctrine of flexible response presupposes the existence of conventional forces sufficiently strong to provide the NATO alliance with options other than those of defeat or an early nuclear response. At the same time, NATO has considered it necessary to retain the possibility of a first use of nuclear weapons at least as long as the perceived conventional imbalance has not been rectified and the other side possesses large and flexible nuclear forces. In a policy declaration, the North Atlantic Council Meeting held at Brussels in May 1989 stated in its communique that "the Allies' sub-strategic nuclear forces are not meant to compensate for conventional imbalances". In June 1990, NATO foreign ministers stated that "for the foreseeable future, the prevention of war will require an appropriate mix of survivable and effective conventional and nuclear forces at the lowest levels consistent with our security needs".

The debate on the need to further reduce incentives for the early use of nuclear weapons in a major war in Europe has continued during the 1980s. In 1979 the United States decided to reduce its stockpile of tactical nuclear weapons in Europe. At the NATO meeting at Montebello in 1983, decisions were taken on the further restructuring of NATO's forces, including an agreement to withdraw a total of 1,400 tactical nuclear warheads from existing stockpiles.

The Soviet Union holds that its military doctrine has traditionally stressed the importance of both non-nuclear and nuclear weapons as elements of an effective military posture. Over the years, the emphasis of these components has varied, reflecting the evolution in the Soviet overall concept of military strategy as well as its perceptions of the threats to its national security. This pertains to the European theatre in particular, which throughout the post-war period has remained the primary theatre of operations in Soviet military planning. In recent times. Soviet military doctrine has elaborated a now approach towards determining the strength of armed forces, their structure and military construction as a whole that is being put into effect. The Soviet Union has stated that in dealing with these issues it proceeds from the principle of reasonable sufficiency for defence.

With regard to strategic offensive weapons, this principle, according to the Soviet Union, requires maintenance of the approximate balance in such weapons between the Soviet Union and the United States. Their structure may differ, but their potential combat capability at any level of reductions should be comparable.

The Soviet position is that for conventional armed forces, sufficiency for defence implies a level of battle strength at which they are capable of repelling possible aggression, but, at the same time, not capable of carrying out an attack and conducting large-scale offensive operations. This means giving armed forces a non-offensive structure; limiting the number of strike-weapon systems; changing the groupings of armed forces and their deployment, with the aim of enhancing their capabilities for defence; and lowering the levels of military production, military expenditure and military activities as a whole.

The Soviet Union has announced that the structure of its Armed Forces is being reorganised in a defensive spirit, as follows. Apart from unilateral reductions in its Armed Forces by 500,000 men (to be completed by the end of 1990) the number of military regions, armies and general military divisions has been reduced. The correlation between means of offence and means of defence is being changed in favour of the latter. Operational manoeuvre groups and concentrated tank groupings have been disbanded. Those Soviet divisions still remaining for the present in the territories of the allies of the Soviet Union are being reorganised. A large number of tanks are being withdrawn from these divisions (40 per cent of those in the motorised infantry divisions and 20 per cent of those in the tank divisions) and taken out of service. The divisions are being given a defensive structure.

Following the unilateral withdrawal of some 500 tactical nuclear weapons from Europe in 1989, the Soviet Union announced that it was willing to make further significant reductions of its tactical nuclear missiles as soon as the NATO countries would formally agree to start negotiations on tactical nuclear weapons in Europe. It also reiterated its proposals to include the issue of short-range nuclear forces in the agenda on disarmament and arms reduction in Europe. In April 1990, NATO agreed to start negotiations on tactical nuclear weapons after the conclusion of an agreement on conventional force reductions in Europe (CFE).

The progress in the CFE negotiations at Vienna, the Soviet conventional force reductions, the restructuring of Soviet and other Warsaw Treaty country forces in a more defensive direction, following the adoption in 1987.of a new military doctrine of the Alliance, as well as the withdrawal of some United States tactical nuclear warheads from Europe, are developments with potentially far-reaching implications for traditional force postures in Europe.

The highest representatives of the Warsaw Pact member States, gathered in Moscow on 7 June 1990 for a meeting of the political consultative committee, stated, *inter alia;* "Participants in the meeting are unanimous in their opinion that the ideological enemy image has been overcome by mutual efforts of the East and the West". They further stated: "Confrontation elements contained in documents of the Warsaw Treaty and the North Atlantic Treaty Organisation that were adopted in the past are no longer in line with the spirit of the time."

At the July 1990 North Atlantic Council meeting of Heads of State and Government, a Declaration was adopted in which it was stated, inter alia, that the Alliance "will never in any circumstances be the first to use force". Furthermore, the Declaration stated the following:

"The political and military changes in Europe, and the prospects of further changes, now allow the Allies concerned to go further. They will thus modify the size and adapt the tasks of their nuclear deterrent forces. They have concluded that, as a result of the new political and military conditions in Europe, there will be a significantly reduced role for sub-strategic nuclear systems of the shortest range. They have decided specifically that, once negotiations begin on short-range nuclear forces, the Alliance will propose, in return for reciprocal action by the Soviet Union, the elimination of all its nuclear artillery shells from Europe.

"New negotiations between the United States and the Soviet Union on the reduction of short-range nuclear forces should begin shortly after a CFE agreement is signed. The Allies concerned will develop an arms control framework for these negotiations which takes into account our requirements for far fewer nuclear weapons, and the diminished need for sub-strategic nuclear systems of the shortest range.

"Finally, with the total withdrawal of Soviet stationed forces and the implementation of a CFE agreement, the Allies concerned can reduce their reliance on nuclear weapons. These will continue to fulfil an essential role in the overall strategy of the Alliance to prevent war by ensuring that there are no circumstances in which nuclear retaliation in response to military action might be discounted. However, in the transformed Europe, they will be able to adopt a new NATO strategy making nuclear forces truly weapons of last resort.

"We approve the mandate given in Turnberry to the North Atlantic Council in Permanent Session to oversee the ongoing work on the adaptation of the Alliance to the new circumstances. It should report its conclusion as soon as possible.

"In the context of these revised plans for defence and arms control, and with the advice of NATO Military Authorities and all member States concerned, NATO will prepare a new Allied military strategy moving away from forward defence', where appropriate, towards a reduced forward presence and modifying 'flexible response' to reflect a reduced reliance on nuclear weapons. In that connection, NATO will elaborate new force plans consistent with the revolutionary changes in Europe. NATO will also provide a forum for Allied consultation on the upcoming negotiations on short-range nuclear forces."

D. Varying Positions on Nuclear Deterrence

Depending on the attitude regarding nuclear weapons and the role of these weapons in international relations, schools of thought on the subject range from acceptance by necessity to total rejection of nuclear weapons (see United Nations Study on Deterrence).

Proponents of deterrence maintain that deterrence is not just a western position but a universal concept. They believe that the success of nuclear deterrence is a political and strategic fact of the post-war period. It has been deemed necessary for constraining the offensive use of military forces and for resisting possible military and political intimidation by a potential opponent. Thus, in their opinion, nuclear deterrence is an exclusively defensive strategy and represents the best means of maintaining stability.

The existence of nuclear deterrence, they believe, has not only preserved the European continent from an East-West armed conflict, but has also led to a historic break with the process of confrontation, which frequently gave rise to armed conflicts. In their opinion, no system of security has been able up to now to offer guarantees similar to those provided by nuclear deterrence. They maintain that deterrence is also fully compatible with the principle of self-defence recognised by the Charter of the United Nations.

Furthermore, they also believe that conventional warfare, which since the Second World War has decimated populations in many parts of the world with increasingly destructive weapons, is no more moral than nuclear non-warfare. Consequently, nuclear deterrence cannot be judged in moral or ethical terms without taking into account what they consider the most relevant criterion in this respect, that of stability: past, present and future. The world is no less secure today than in 1914 or 1939 when nuclear weapons were unknown.

The critics of nuclear deterrence point out that nuclear weapons are weapons of mass destruction radically different from any other weapons mankind has previously known. They are weapons that defy traditional, concepts of strategy. Any nuclear weapon State that relies on nuclear deterrence they believe, must ultimately be prepared to employ its weapons. They contend that military response, according to international law, must not be out of proportion with an armed attack. The use of nuclear weapons in response to a conventional attack would be, however, inherently a disproportionate response. Furthermore, their use would entail a risk of escalation to an all-out nuclear war, which would mean not only the total destruction of combatants, but also a threat to the survival of non-nuclear weapon States and, in the end, of all mankind. The order of damage likely in a nuclear conflict would be beyond all historical experience. The overwhelming majority of non-nuclear weapon States have rejected nuclear weapons and related doctrines as a means for their security.

A basic conceptual difficulty associated with the doctrine of nuclear deterrence in the opinion of its critics is that it continues to expound the utility of the possession of nuclear weapons and their possible use. Since all States have equal rights to security, such an approach, they argue, runs counter to desired objectives of nuclear non-proliferation, particularly in an environment of improved international relations. In addition, critics argue that it is not possible to prove that nuclear deterrence is to be credited with the maintenance of peace in Europe. In any case, the risk of nuclear war is unacceptable to them. Furthermore, they believe that in some cases the possession of nuclear weapons complicates the solution of international problems, particularly at the regional level. A country that possesses nuclear weapons and is not a party to the Non-Proliferation Treaty will rely on such weapons, for purposes of intimidation or if necessary for use, as long as regional problems remain unsolved, and it will do so in its dealings with parties that do not have nuclear capabilities for warlike purposes. In such a case, nuclear deterrence thus becomes a significant factor militating against the integrity of certain regions.

Other criticisms include, the issue of rationality. Critics contend that misperception of the other side's motives, miscalculation or even accidental launch of weaponry could remove weapons from rational control.

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RUSSIAN DETERRENT FORCES IN THE POST-COLD WAR ENVIRONMENT

The rapid changes that are taking place in Europe and indeed throughout the world—owing primarily to the end of the cold war and the democratic revolution in the former Soviet Union—will force nuclear powers to make major adjustments in their foreign policy and in their military-technological thinking. There will be changes in their nuclear doctrines and in their assessment of the nuclear forces both strategic and tactical that will be needed to ensure national security.

This applies fully to Russia, whose nuclear doctrine, like that of the North Atlantic Treaty Organisation (NATO), is now being entirely revised. To identify the main areas in which this complete revision must take place, we must first understand the nuclear doctrine of Russia and the mission of its nuclear forces.

The Former Soviet Union and the Doctrine of Deterrence

In its public declarations, including those made at the highest political level, the former Soviet Union was strongly critical of the doctrine of deterrence. This, in turn, perplexed and sometimes even irritated those who considered nuclear weapons to be the only effective means of averting a global war. The doctrine of nuclear deterrence thus became almost sacrosanct, a view which may have been prompted by Soviet criticism of it. But, was the difference in doctrines really fundamental? Setting aside various ideological stereotypes and emotional attitudes, we must say "No".

Deterrence as a principle of military strategy was not invented in the nuclear age: it is as ancient as war itself. In both terminology and substance, this principle is consistent with a defensive military strategy: rather than calling for an attack on the potential enemy, deterrence implies dissuading him from the idea that he can attain his objectives through war. The deterrence doctrine was initially synonymous with the doctrine of preventing war by creating an adequate threat of retaliation, that is, by discouraging aggression.

Has the nuclear age added any new dimension to this situation? Only one: because of the tremendous destructive power of nuclear weapons, what now makes deterrence valid is the threat of total annihilation or unacceptable damage.

It would be naive to believe that any nuclear Power, unless it is planning to strike first, follows any doctrine other than that of deterrence. The Soviet Union was no exception. While anathematising nuclear weapons and strongly denouncing nuclear deterrence, it had, in practice, been guided by this very doctrine. The purely military function performed by the Soviet strategic forces had been largely similar to that of the United States strategic forces. The only difference was that the Soviet leadership (former President Gorbachev in particular), in contrast to the United States Administration, believed that further reliance on nuclear weapons as a means of preventing war was hopeless and very dangerous.

From an unbiased historical analysis of the post-war period it can also be seen that military competition between the Soviet Union and the United States in the nuclear field followed the logic of "action-reaction", the constraining factors being primarily financial and technological rather than moral.

The Soviet Union, having gained Super-Power status largely because of nuclear weapons, sought in the 1970s and 1980s to keep that status at any cost by maintaining military and strategic parity with the United States. Parity was initially interpreted as numerical equality in strategic nuclear arms and later as rough equality in operational nuclear capabilities. Indeed, the Soviet-American nuclear rivalry continued unabated even after the potential for assured destruction had been exceeded many times over. Such were the tough rules of the game in the bipolar world, where the Soviet Union and the United States deterred each other by acting on the assumption that the other side was an "evil empire".

That the Soviet Union had based its policy precisely on the doctrine of deterrence is confirmed also by the anti-ballistic missile (ABM) Treaty, which limits the anti-ballistic-missile systems of the two sides to purely symbolic numbers. The Treaty has, in essence, legitimised the situation of mutual nuclear deterrence through the threat of the assured destruction of the aggressor by a retaliatory strike.

In terms of strategic stability this situation has not changed, even after the dissolution of the USSR, and it cannot be disregarded. Nuclear deterrence is a *modus vivendi* of the world we live in, and will continue to be until nations devise a fundamentally new system of maintaining international security. The problem is that the nuclear powers, including Russia, have more than enough nuclear weapons to make deterrence work effectively.

New Dimensions of Nuclear Disarmament

Some well-known, high-ranking Western analysts had been saying for several years that public acceptance by the Soviet leaders of the doctrine of nuclear deterrence would contribute to mutual understanding, strengthen the credibility of the USSR in the eyes of the West, and probably bring us closer to agreements on radical cuts in nuclear arms. Even before the break-up of the Soviet empire, there were signs of an important conceptual movement in that direction. For example, it was admitted at a high political level that the USSR often took an overly simplistic view of the deterrence doctrine. It has also been stated that this doctrine should be given due credit and that it should be recognised that over a fairly long period of history it was instrumental in maintaining peace. There has also been evidence of a willingness to hold an in-depth discussion of the concept of minimum nuclear deterrence at an expert level between nuclear powers and nuclear weapons-basing States. Finally, the new Commonwealth of Independent States (CIS) is now calling its nuclear strategic forces "strategic deterrence forces" (SDF).

These facts signal a willingness, not only to take into consideration the conceptual approaches of the other side, but also to take them into account in foreign policy, and what is more important, in military and technological practice. For the first time ever, our leaders have agreed that as we move to a nuclear weapon free world it is possible, as an interim stage, to reach a level of nuclear confrontation that would correspond to the Western concept of minimum nuclear deterrence. That conceptual shift is crucial in determining the thrust of a new Russian nuclear doctrine and the levels of sufficiency for strategic and tactical nuclear weapons. This shift may appear to be a conceptual concession to the West, but in reality it has been caused by a good number of both international and domestic factors.

First, the end of the cold war makes quantitatively senseless and economically burdensome the infrastructure of the military power confrontation that was built in the years after the Second World War. In the Paris Declaration of 19 November 1990, 22 States, including the Soviet Union and the United States, solemnly declared that they were no longer adversaries. This fact cannot leave unchanged a major component of the above-mentioned infrastructure—the mechanism of mutual nuclear deterrence. A radical transformation of this mechanism is facilitated, not only by the improved Russian-American relationship, but also by other factors, such as the diminished role of the two Super-Powers in international relations, the growing interdependence of nations, and the objective need to deal jointly with global development problems. In these conditions, Russian and United States national interests can be expected to converge more and more, and their policies will most likely reveal qualitatively new elements of interaction and even partnership. By the same token, the role of mutual deterrence in their relations and, consequently, reliance on it within their respective national security policies, are likely to decrease in relative terms.

Furthermore, for a number of reasons, including an obvious reduction of the reciprocal military threat, Russia and the United States will confront a rapidly mounting tide of economic and international political pressure in the 1990s in favour of radical reductions in nuclear arms. This pressure has already been translated into substantial cuts in military budgets and, accordingly, in appropriations for strategic programmes in both countries. The effect of the budgetary pressure on the military postures of Russia and the United States will probably continue to mount. As for Russia, its transition to a market economy will inevitably compromise its ability to compete effectively with the United States in the deployment of new kinds and types of strategic arms. It should be recognised that strategic parity with the United States was achieved when the USSR was run by a system that permitted uncontrolled funding of military programmes at the expense of the civilian sector of the economy. Such practices are no longer possible. In any event, resources and funds will certainly be allocated strictly in accordance with the national security priorities approved by the supreme legislative authorities rather than in the interests of the military-industrial complex.

There is a new factor that will curb and restrain the ambition of the national military-industrial complex to match the United States in building strategic forces: it is the dissolution of the USSR and the growing influence of the independent States (the former Soviet republics) on the development and even the placement of nuclear arms. In 1988, the federal government met with strong opposition from Kazakhstan (as well as some regional authorities of the Russian Federation) to nuclear testing on their territories. The Novaya Zemlya test range was shut down by Russian President Boris Yeltsin in 1991. The formal Soviet one-year unilateral moratorium, declared by Mr. Gorbachev in the fall of 1991, was motivated to a great extent by a unilateral moratorium that had already lasted for more than a year. Finally, a very important agreement was reached in Alma Ata on 21 December 1991 that by 1 July 1992 Belarus, Kazakhstan and Ukraine would ensure the withdrawal of tactical nuclear weapons to central bases adjacent to the manufacturing plants for dismantling under joint control. Strategic nuclear weapons will be withdrawn from the territories of Ukraine, Kazakhstan and Belarus on the completion of the implementation of the Strategic Arms Reduction Treaty (START), that is to say, by 1998 (and from Ukraine even earlier—by 1995). Strategic nuclear missile forces located on Ukrainian soil, as well as in Kazakhstan and Belarus, are already being de-activated.

Regardless of the domestic developments in the "geopolitical space" that used to be the Soviet Union, the central control over strategic nuclear forces will be preserved. It would be hard to imagine that Kazakhstan or Ukraine would be able to have separate national strategic nuclear forces: they would have to build their own national satellites, early-warning systems and many other things now included in the "military infrastructure" of offensive strategic forces. Although such a possibility cannot be completely ruled out, I have serious doubts that such options would be affordable for some of those sovereign States. I also think that those States will be heavily dependent in the years to come on Western countries, including the United States, which apparently will not watch with indifference the emergence of new nuclear powers in Europe.

I am far from overdramatising the situation in the strategic sphere. What is really possible is that for a very short transitional period Kazakhstan and Ukraine would reserve the "right of veto" as regards the strategic nuclear weapons in a retaliatory strike by the central authorities through a so-called "conference-link" mechanism. This understanding is provided for in the Alma Ata and follow-on agreements between the Independent States. These documents also include the provision that the decisions regarding the need to use strategic nuclear weapons should be taken by the Russian President in agreement with the heads of the member States on the basis of procedures drawn up jointly by the member States. The member States also confirm the obligation not to be the first to use nuclear weapons.

These developments have already compelled the Russian central military and political authorities to revise the existing basing pattern for strategic offensive arms and tactical nuclear weapons and to impose severe legal restrictions on relevant military activities. As for tactical nuclear weapons, they are now being moved as a matter of urgency to Russian territory. It is likely that all facilities for strategic offensive arms will also be moved to Russian territory.

In this context it is quite natural that Russia is now already unilaterally introducing certain adjustments in its conceptual approaches both as to the most likely ways of using strategic offensive arms in a retaliatory strike and as to the future development and placement of its strategic forces. Moreover, in the context of domestic instability Russia will be the State most likely to be interested in maintaining much more centralised but much smaller nuclear forces.

Domestic developments explained to a great extent the receptiveness of Mikhail Gorbachev as well as of Boris Yeltsin to George Bush's initiative on nuclear weapons last fall.

On 27 January 1992, Boris Yeltsin proposed cutting strategic forces to 2,000-2,500 warheads along with "de-MIRVing" ballistic missiles—both intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs).

What was even more important was Mr. Yeltsin's proposal that the strategic offensive arms which Russia and the United States will retain after the planned deep cuts should not be targeted on United States or Russian facilities respectively or on those of any other country. In specific terms, that would mean a number of practical steps. We may consider taking off alert status the strategic forces of Russia, the United States and other nuclear powers, which are targeted on one another's territories or facilities, thus placing nuclear weapons on a "zero-alert posture".

It is clear that in this context there is a need for a fundamental revision of the entire military and strategic situation in the world and consequently of nuclear military doctrines. Ideas that have been formally proposed concerning control over nuclear weapons by an international organisation, for example the United Nations, could be reconsidered.

Will Russia Need Nuclear Weapons?

As regards future dramatic reductions of Russian nuclear weapons, it should be borne in mind that it would be unrealistic to expect Russia to abandon its reliance on nuclear deterrence in the foreseeable future. Neither country will be able to ignore for long the existence of other nuclear powers or the risk of further proliferation of nuclear weapons.

Moreover, Russia will also have to face the fact that a number of factors that were not relevant at the time of the East-West confrontation now tend to introduce elements of uncertainty into the situation in Europe and in the world at large.

First, during the cold war the Soviet military threat forced the Western allies to sacrifice certain national ambitions to the need to counter a common enemy. Today, national aspirations may come to the fore again and stimulate geopolitical competition between certain power centres.

Secondly, a new and powerful player has entered the European arena—a united Germany, whose policies will be aimed at vigorously strengthening in every way Germany's position *vis-a-vis* the other parties in this new international game.

Thirdly, the decline of the bipolar security structure in Europe calls into question the role of the United States as the leader of the free world and, accordingly, its military-political position on the continent. Germany may soon seek gradually to force the Americans out of Europe and to claim the role of a new European Super-Power—something that the United States would hardly welcome.

Finally, we cannot ignore the factor of regional extra-European risks, particularly on the periphery of the European continent, the areas where fires have been smouldering for years.

Given a very uncertain situation in Europe and in the world as a whole, reliance on nuclear weapons as a military-political safeguard will therefore remain a key element of Russian military doctrine, at least in the 1990s.

Basic Parameters of Minimum Nuclear Deterrence

Strategic Nuclear Weapons

The idea of reducing strategic nuclear armaments to the level of minimum deterrence is currently valid for two powers only—Russia and the United States, whose capabilities far exceed any theoretical limit of sufficiency for launching a destructive retaliatory strike. Even though a nuclear force much smaller than the ones currently possessed by the United States and Russia may always have been sufficient to enable them to deter each other from launching an attack, both sides continued their nuclear programmes on the basis of exaggerated criteria of what constituted unacceptable damage in a nuclear war.

Although the START Treaty is a signal that both sides intend to leave confrontation behind, one should admit that the Treaty constitutes a very modest step towards limiting their nuclear capabilities to the level of minimum deterrence.

It is extremely important, in terms of enhancing stability and moving towards minimum nuclear deterrence, to make nuclear disarmament a continuous process. Moscow and Washington should initiate without delay the next stage of arms control negotiations, which could focus on the reduction of their strategic offensive arms by another 50 to 60 per cent. This could involve the complete elimination of the weapons systems that each side considers to be the most dangerous and provocative.

The next stage of strategic offensive arms reductions would thus be focused not so much on numerical reductions as on shaping strategic force structures in such a way as to deny either side a material and technological basis for delivering a surprise first strike. Thus, Russian SS-18 intercontinental ballistic missiles, as well as SS-N-20 submarine-launched ballistic missiles, should fall into the category of weapons systems to be banned. For the United States the MX ICBMs and the Trident II SLBMs would be subject to a complete ban.

If the Russian-United States political interaction continues to develop in a positive direction, Russian nuclear doctrine will be revised with or without any negotiations. In all likelihood its nuclear doctrine will be reduced exclusively to the capability for inflicting unacceptable (rather than equal, as is the case now) damage on a potential aggressor through a retaliatory strike. A minimum nuclear potential with assured survivability would therefore suffice. Achieving this objective, however, will depend on the positions of other nuclear powers, primarily the United States, and, in particular, on their ability to threaten the survivability of Russian minimum deterrent forces.

Tactical Nuclear Weapons

The issue of tactical nuclear weapons is for the most part a political rather than a military one. For instance, the West has always viewed

United States tactical nuclear weapons in Europe as a deterrent against a potential attack by "overwhelming Soviet conventional forces" and also as "a transatlantic tie-in" with United States strategic nuclear forces. Because of this coupling function, such weapons, as well as French and British theatre nuclear weapons, have always been considered pre-strategic rather than tactical. Russia, with its sufficiently invulnerable capability in strategic nuclear arms, does not need tactical nuclear weapons for either military or political reasons.

The signing of the Treaty on Conventional Armed Forces in Europe (the CFE Treaty), which presupposes the elimination of imbalances and asymmetries in conventional armed forces on the continent, certainly opened up good prospects for radical reductions in tactical nuclear weapons to the level of minimum deterrence.

The "disarmament race" of the United States and USSR Presidents in the fall of 1991 resulted to a great extent from that development. On the basis of reciprocity, Russia will take substantial measures with a view to eliminating tactical nuclear weapons. The two sides could reach agreement on procedures and timetables for implementing such measures through consultations. Moreover, Russia proposed to the United States that all naval tactical nuclear weapons should be eliminated on the basis of reciprocity. All nuclear munitions (gravity bombs and air-launched missiles) would be removed from combat units of frontline (tactical) aviation and placed at central weapons storage facilities on the basis of reciprocity. It also proposed that other nuclear powers should join in these steps with respect to tactical nuclear weapons. However, as in the case of strategic forces, arms reduction in Russian tactical nuclear forces has, in fact, largely been predetermined by the political developments on the continent.

At present, however, the former Soviet proposal for an immediate "zero solution" on tactical nuclear weapons would probably not serve the long-term interests of Russia. After all, Russian aircraft represent the chief element now capable of offsetting the tactical nuclear and conventional capabilities of NATO's naval forces in Europe, to say nothing of the need to cover possible regional extra-European risks. At any rate, it is clear that the residual tactical nuclear capabilities of both sides should be confined solely to the function of deterrence.

The level of minimum tactical nuclear deterrence will tend to go down as mutual trust increases in Europe and other disarmament issues are resolved, and will also depend on the overall evolution of the European and the world situation.

A major problem which has a direct bearing on determining the level of minimum nuclear deterrence concerns the elimination of all non-strategic naval nuclear arms. Unless this problem is resolved, other nuclear disarmament efforts will probably lose their value because wide channels will be open for a massive transfusion of military rivalry to this area and for circumvention of future agreements on strategic offensive arms and tactical nuclear weapons.

With respect to long-range, sea-launched nuclear cruise missiles, whose fate has been left unclear, the cardinal solution would be their complete elimination. This is what it would probably take to achieve a situation of “zero tactical nuclear deterrence” at sea.

In general terms, minimum deterrence is obviously a purely abstract notion as applied to land- and sea-based tactical nuclear weapons and may be considered only as an interim stage in the movement towards their complete elimination. Indeed, minimum deterrence presupposes that the nuclear threshold is as high as possible. Yet, this threshold tends to go down as non-strategic weapons are preserved in the arsenals of both sides. Therefore, minimum deterrence in the future should be provided exclusively by Russian and United States strategic forces of 500 to 2,000 warheads each—depending on the point at which other nuclear powers will join in the nuclear disarmament process—while all non-strategic nuclear weapons should be phased out.

Challenges for Nuclear Deterrence

In the move, via bilateral and multilateral verifiable agreements, to new levels of minimum nuclear deterrence, qualitative and quantitative parameters of nuclear arsenals will contribute, not only to overcoming past confrontational issues, but also to a deep and irreversible restructuring of international relations.

A phased process of nuclear disarmament does not preclude the existence, at certain times, of mechanisms of nuclear deterrence. However, in this period, the essence of which is a transition from nuclear oversaturation to a non-nuclear world, deterrence through nuclear forces would be transformed into deterrence by politics, law, transparency and verification.

This picture may, however, be assessed as too bright. The most probable development will involve certain braking mechanisms that would switch on simultaneously in the course of this process. As practice has shown, nuclear disarmament is an element of “higher resistance”, and after “arms control” ends and the elimination of nuclear arms begins, resistance will increase. In other words, achieving a level of "minimum deterrence" is possible in the first place at the cost of the elimination of excessive nuclear arsenals, but as the process continues, the harder it will be, until a "minimum nuclear deterrence" level may become an unnegotiable barrier on the way to a non-nuclear world. Achieving a minimum agreed level of nuclear arms does not touch the essential basis of deterrence nor does it provide an answer to the question what will be the ultimate foundation of international security in a non-nuclear world.

It would not be possible to jump over this barrier in one leap and to do away with nuclear weapons all at once, as some suggest, unless humanity saw that the world it was entering would be safer than the former one. Building a non-nuclear world under current conditions certainly cannot be understood as simply going back to the pre-nuclear world with all of its problems and contradictions.

One of the major problems that arises in this context is that nuclear weapons are an organic element of the system of international security formed after the Second World War. However, great the efforts that might be exercised at the highest political level to go beyond the limits of the cold war, the mutual nuclear deterrence situation that took form in monstrous military potentials will tend to perpetuate confrontational inter-State relations.

The doctrine of deterrence has in it a built-in concept of a fierce enemy, an idea of mutual intimidation and competition in nuclear build-up. The gradual overcoming of these stereotypes presumes, in all probability, a new look at nuclear weapons.

Indeed, until recently, the nuclear threat was *personified.* Each side regarded the other as the bearer of such a threat. From this there arose false assessments of the intentions of the potential enemy which, in turn, led to destabilisation. If the "image of the enemy" evaporates, then the nuclear threat is also de-personified. The bearer of the threat vanishes and only the threat proper remains. Psychologically, it originates now, not from the other side, but from the nuclear weapons themselves. The very nature of these weapons is such that no matter how small a quantity of them is left in the world, and even if the threat of an intended nuclear war were to be reduced to zero, as long as there are nuclear weapons there would continue to be a danger that war would break out as a result of an accident, a wrong assessment or provocation. However, low the level of nuclear balance may be, it is incompatible with real security, national or international, which, by definition, is the absence of danger. Common sense tells us that it should not be a matter of nuclear deterrence, but of deterrence of nuclear weapons themselves. This means a halt to their build-up and modernising as well as a gradual but continuous elimination of the stocks until they are completely eliminated and there is a ban on their production.

In this context one may say with confidence that there will be no future for nuclear weapons if mankind moves to a new kind of world in the twenty-first century, a more homogeneous world. Viewed in its broad historical context, the absurd character of the doctrine of deterrence is revealed in all its folly.

Is It Possible to Go beyond Deterrence?

In a divided world the task of reducing the risk of nuclear confrontation seems to be confined to reaching the level of minimum nuclear deterrence. However, to overcome the need for deterrence altogether it will really be necessary to change the current structure of international relations, which is characterised by narrowing, but still profound, differences in the socio-economic systems of industrialised States and by a lack of stability in Europe, including Russia and other members of the Commonwealth of Independent States, and in the developing world. Such a change may in fact be possible only by introducing elements of universal federalism into today's system of international relations, that is, a restructuring on the principle of a United States of the World.

Global problems can be resolved only by the combined efforts of all nations. There is a growing understanding that the contemporary world is not composed of several mutually exclusive civilisations, but rather of one common civilisation in which there should be common values and freedom of choice. Important integrative processes are under way in the political sphere, although so far these are manifested in the forms inherited from the post-war period. The European continent is the scene of gradually maturing elements of new international security structures, replacing military blocs. In general, the axis of global conflicts is gradually shifting from East-West to North-South relations. This shift will force industrialised countries into a closer relationship, one that is changed from passive mutual understanding to active interaction and businesslike cooperation.

At the same time, a process of globalisation of economic life is evolving that should eventually result in the establishment of an integrated world economy and of a genuinely universal market. In such an environment, the need to maintain deterrence will simply cease to exist.

In this context the well-known American concept of going beyond containment apparently deserves attention. After all, it is predicated on the idea of incorporating Russia and other Commonwealth States into the world community and of jointly resolving global problems. If freed of various ideological and military power stereotypes inherited from the past, and given a truly human dimension, this concept may serve as a basis for the world's progress to a new community of the twenty-first century and therefore pave the way for overcoming deterrence *per se.* Naturally, such an approach presupposes not only Russia's return to the fold of world civilisation but also a profound change in the approach of the United States and other Western countries to Russia and to the world as a whole. Overcoming containment and deterrence implies the final renunciation of ideological stereotypes that nations have been living with for more than 70 years. It also implies a vision of not only short-term but also long-term prospects for the development of civilisation, and an unambiguous recognition of the fact that the ideal social system of the third millennium will be characterised only by a synthesis of all the positive experiences accumulated by human societies.

NUCLEAR WEAPONS IN THE NEW WORLD ORDER

Almost universally over the past thirty years (since roughly the Cuban missile crisis), nuclear weapons have been viewed as deterrents of last resort, not as tools of any other policy. This occurred under conditions when the world's large powers were committed not to make major changes in the status quo by force. The fear that attempting to make such forcible major changes could escalate to nuclear war played a role in this restraint. But, reciprocally, the very stability of cold-war arrangements helped make the status quo acceptable.

As a result, except for the threat inherent in the nuclear standoff, a threat which participants became increasingly confident they could deal with, the major powers did not face threats of invasion or extinction, such as they faced before World War II. The period after the Second World War has seen wars of national liberation, wars of religion, wars to maintain or marginally change the status quo, but very little of the balance-of-power wars involving great powers directly which were prevalent in all earlier periods. Such wars have been viewed since World War II as not worth whatever policy objectives may be at stake.

These stable cold-war relationships have now given way, to be replaced by others as yet not clearly discernible. The main question facing any analyst of the future role of nuclear weapons is whether any nuclear or nuclear-capable Power will perceive threats to its ultimate autonomy or existence. If they do not, nuclear weapons, given their nature as dangerous and indiscriminate instruments of destruction, are likely to remain in the background, or subside deeper into it, deterrents of last resort against improbable threats. Cooperative arrangements for managing questions regarding nuclear weapons are then likely to be effective. The non-proliferation regime, as an example, will probably be enhanced. A movement towards meaningful international control of these weapons and agreed reductions to very small numbers can also be envisaged.

If, on the other hand, relations are unstable and the Governments of some nuclear or nuclear-capable powers perceive that there are serious threats to their security, questions regarding nuclear weapons—questions of purpose, national control, size of deployments, modernisation measures—will loom larger on policy agendas. Perceptions of such potential serious threats could arise, for instance, from failure of the current attempts to keep Germany integrated into either the North Atlantic Treaty Organisation (NATO) or a West European nuclear alliance; from threats by a resurgent Russia against some of its neighbours; from abandonment by the United States of its extended deterrent policy with respect to Japan, together perhaps with new evidence of nuclear developments in Korea. While the details of each Government's reaction to such events is not predictable, the constructive developments noted in the previous paragraph (de-emphasis of nuclear weapons, cooperative security regimes, enhanced non-proliferation regime, movement towards international control) would be less likely to occur.

Thus, the future role of nuclear weapons must be evaluated in the light of the future stability of security arrangements, particularly as they affect the larger powers. In what follows, we attempt to sketch some elements of such an evaluation. We do this in three sections. The first deals with the nuclear aspects of the United States Commonwealth of Independent States (CIS) relationship. The second deals with nuclear weapons and other major powers. The third deals with some characteristics of the nuclear weapons question elsewhere. Given the breadth of this assignment, we will attempt to identify major drivers for nuclear policy rather than detailed options in each area.

The New United States-Russian-CIS Nuclear Relationship

The United States, Russia, Ukraine, Belarus and Kazakhstan are engaged in an unprecedented exercise in nuclear force reduction and consolidation, combining technological, bureaucratic, political and economic factors on several fronts. The major elements of the situation may be summarised as follows.

First, all parties apparently wish to minimise the likelihood and dangers of any future nuclear confrontation. The United States and Russia have indicated that their preferred means to that end are the consolidation of former Soviet nuclear forces under a single command and control structure, the accession of the other republics to the non-proliferation Treaty (NPT) as non-nuclear States, and deep mutual reductions on both sides in the numbers of nuclear weapons and weapons systems. The CIS republics other than Russia have agreed to most of this. At the date of this writing, Ukraine and Belarus have agreed to accede to the NPT as non-nuclear States. Kazakhstan has not, though it has agreed not to have nuclear weapons on its territory.

Secondly, President Bush, former Soviet President Gorbachev and Russian President Yeltsin have made specific commitments to withdraw and destroy tactical nuclear weapons, to speed up the START timetables for reductions of strategic weapons and to reduce alert levels, with Yeltsin proposing that the United States and Russia stop targeting each other.

Thirdly, the CIS republics other than Russia retain some suspicion of ultimate Russian goals and Russian capabilities. A complex bargaining is going on, involving all four republics, the United States and other Western States capable of giving economic help to the CIS republics. On 12 March 1992, for example, Ukraine's President Kravchuck announced that, while not changing the overall policy that Ukraine is seeking to become nuclear weapon free, he was halting further shipments of tactical nuclear warheads to Russia and that Ukraine intended to eliminate the warheads on its own soil, near Chernobyl, with foreign assistance.

Fourthly, the United States Government has made available $400 million to assist the CIS in the destruction, under safeguards, of nuclear and other weapons. Using some of this money, Germany, Russia and the United States have proposed an international science and technology centre that would help support scientists and engineers of the former Soviet Union during the period of transition from defence to peacetime endeavours and be funded by the United States and others. The focus, here too, includes especially nuclear weapons personnel. These developments pave the way to a new United States-Russian-CIS nuclear relationship. How will it evolve? How stable will it be?

The transition period which the CIS republics are now going through poses a number of perils for the relationship among these republics and particularly Russia with the United Slates and the Western community as a whole. Internal instabilities in the republics arising from economic or nationalist causes, or from simple lack of experience, overbearing or clumsy attitudes on the part of the United States, unfulfilled expectations of help from the West: all these could occur and derail progress towards security cooperation. It would be a welcome development for the Soviet (and former tsarist) empire to adjust to new forms of governance peacefully, and it might be quite meaningful for what it would say about the perceived importance of territorial empires today. However, it cannot be counted on.

Yet, it may be reasonable to speculate that at least some aspects of the nuclear relationship will fare better than the non-nuclear relationships. The reason is that nowhere else is there as clear-cut a community of interest between the United States and Russia as in nuclear matters, and nowhere else is that community of interest so clearly perceived on both sides. Both sides to some extent consider nuclear weapons to be a dangerous bargain with destiny, with far more downside than upside potential. Nuclear weapons were not needed for the United States and Russia to be great powers, but they could spell the downfall of both.

Thus, the measures proposed for reducing and in so far as possible eliminating the dangers of the nuclear confrontation, retaining only sufficient weapons perhaps to maintain a clear margin over the other nuclear weapon States, are not fundamentally controversial in the United States, Russia or the other nuclear republics. Of greater political importance are the negotiations among the republics and between the republics and the West about who will control the remaining nuclear and conventional forces, and how many of the treaty-limited forces will accrue to each republic. Nuclear forces are tied to conventional threats to some extent. If Russia were to retain forces more threatening than those envisaged in the Treaty on Conventional Armed Forces in Europe (CFE), the basis for nuclear arms reductions would be changed. This, at the date of this writing, seems an unlikely outcome,[7] but the CFE Treaty was not written with the security of the former Soviet republics (or for that matter of the Central and Eastern European countries) *vis-d-vis* each other in mind.

Disagreements on conventional arms, economic, human rights and other matters will to a degree set the political climate for nuclear decisions. The realisation that this is the case is one spur for making rapid progress on the nuclear question in a way that is politically satisfactory to both sides.

In the future, the United States will almost surely direct its foreign policy towards retaining workable strategic relationships with the other major power centres in the world—Russia, Western Europe, China, Japan—at least, in order to prevent the recurrence of the major crises which in the past have led to the kinds of central wars that would now be completely destructive. In the absence of specific local causes for serious disagreements, such as a Russian threat to Central Europe, or a Russian or American threat of dominance over Iran, the two former adversaries will have incentives to make common cause on global security issues. Granted the great uncertainties over the short term at least, a continuation of the current cooperation in nuclear matters between the United States, Russia and the other CIS republics concerned should lead to continued reductions in numbers of nuclear weapons and the associated systems, as well as to continued cooperation in ensuring the safe control and operations of those systems that remain.

The remaining major questions concern the extent to which a CIS with some true control over nuclear weapons will exist; whether Russia will have a nuclear monopoly if the CIS is not effective; and what the United States will do about these issues. In principle, a CIS control structure requiring multiple agreements to carry out any serious action, similar to NATO, would be a stabilising factor, regardless of where the nuclear weapons are stationed; In practice at present, the choices are hostage to the tactical political relationships among the individual republic leaders, their effectiveness, their knowledge of the questions, and their durability in office. In the short run also, these choices cannot be dissociated from bargaining over other matters.

Eventual numbers are likely to be set by the levels which can be agreed to and verified worldwide. These levels will depend on factors that lie mainly outside the United States-Russia relationship, for instance, European arrangements for deciding nuclear weapons questions, Chinese and Japanese perceptions of their security, and the demand or lack of it for nuclear deterrence elsewhere in the world. We take up some of these questions next.

Nuclear Weapon and Other Major Powers

The question of what is a major Power cannot of course be given a definitive or clear-cut answer. For the purpose of this study, major powers will be taken as those powers agreement among which is needed to contain worldwide instabilities and conflict. Today these include at least the United States, Russia, China, Japan and the principal nations of Western Europe. The requirements for stable relationships and the nuclear aspect of these relationships are discussed very briefly in this section for China and Japan, and, somewhat more extensively, for Western Europe.

China and Japan

China is now one of the world's five most influential powers, taking into account political, economic and military dimensions. This appraisal is based partly on China's potential: given peace and domestic stability, China's resources, its economic growth rate and its handling of the military dimension of power point to its rivalling the other four Power centres noted in all important respects within two or three decades.

This development need not be a threat to stability, but it may be viewed as such, particularly if the existing competing powers do not anticipate it and do not prepare to accept it. China's permanent seat on the United Nations Security Council should ease the transition in that it provides an appropriate—but only one—forum for consultation. China's foreign policy and its year-to-year variations reflect the requirements of domestic politics, but its pursuit of an appropriate security, and especially nuclear security, posture is likely to remain cautiously independent.

China will have to be considered an equal in resolving questions having to do with nuclear weapons management worldwide, if those questions are to be settled cooperatively at all. As of the date of this writing, it is unlikely that China will agree to reduce or even open its nuclear facilities and forces to measures of transparency so long as the United States and Russia have so many more systems than it has. At the same time, China is showing an increasing inclination to cooperate in nuclear non-proliferation efforts, possibly as a result of the current perceived possibility of a nuclear weapons programme in North Korea.

Japan has a strategic dilemma, with an indeterminate outcome. Japan has stretched a small (relative to other powers of its magnitude) geographical base, with a medium-sized, if highly talented and disciplined, population into an economic Super-Power. Setting aside the question of the extent to which Japan can maintain its economic growth, Japan's strategic dilemma derives from the twin facts of its military vulnerability and the difficulties it would face in remedying that vulnerability.

The military vulnerability consists of having more vulnerable, yet more necessary, supply lines than its fellow Super-Powers, and a greater vulnerability to nuclear coercion or attack than at least Russia, China and the United States. Japan has, with United States backing, spent its significant defence budget ($30 billion-$35 billion) on erecting high-technology conventional defences of its home islands and to some extent the surrounding seas. To do more, for instance to acquire a long-range fleet and air force, would have a high likelihood of bringing Japan into at least diplomatic conflict with the United States, China and Russia, and might bring more severe costs. Thus, Japan, to an unusual extent for the powers under discussion here, is dependent on the good will of the other major powers for its security. This good will, justifiably or not, sensibly or not, is being frayed by Japan's very economic success.

Japan must either retain a military alliance with the United States which they themselves perceive to be reliable under all conditions, or develop one with another nuclear Super-Power, currently an unlikely event, or become an integral part of a greater whole, as Germany is and can hope to remain, or build forces of its own which could induce instabilities. The fact that Japan is not now militarily threatened does not relieve the dilemma: the United States, Russia, Europe and China are not militarily threatened from the outside either, but they are unlikely to reduce their forces to purely defensive elements or to abandon their nuclear forces. Japan clearly views its security in global, not local, terms, given its global sources of supply, markets and sources of competition.

The outline of a long-term solution to this problem is unfortunately not visible at present. Incorporating Japan into cooperative frameworks for nuclear decision-making in the Pacific region or globally may help, but these frameworks will have to be based on substantially greater perceived security consensus in the region than is evident now if they are to resolve Japan's strategic dilemma. The economic, security and nuclear aspects of this dilemma cannot be separated.

Non-Russian Europe

The geopolitics of nuclear weapons in Europe outside Russia are unlike those anywhere else in the world. Europe contains three separate but related centres for nuclear decision-making—NATO, the United Kingdom and France, plus one non-nuclear Power, Germany, which is intimately involved in some nuclear decisions. The United States is also intimately involved, both through NATO and through its special relationship with the United Kingdom. The European Community (EC), some years from now, could evolve into a strategic Super-Power, with or without a nuclear dimension. There is also a highly interested group of European nations, from Ukraine to Italy, which views its security future as closely linked to the nuclear weapons decisions made in and for Europe.

We focus in this analysis on the relation between underlying security perceptions and the role of nuclear weapons. Particularly topical in Europe is the question how these perceptions will shape the mechanism by which nuclear weapons decisions will be made, as well as what the decisions will be. At least three factors enter into the security perceptions of the European polities concerned with regard to nuclear weapons.

The Uncertain but Probably Positive Value of Nuclear Deterrence in Uncertain Times

At present, nuclear weapons and nuclear deterrence are not at the top of the agenda of most European nations, with the possible exception of France. The attention of the policy makers even in that case is dominantly on economic matters.

Nevertheless, the existence of potential threats to vital interests is everywhere an input to policy. Nuclear weapons are viewed as having a potential positive value as deterrents in situations which are in the main remote but not impossible to envisage. While such a general statement is probably true everywhere, it has special relevance in Europe for at least two reasons. One is that European nations are being unpleasantly reminded by events in Yugoslavia and concerns elsewhere of their historical difficulty in averting the kind of devastating intra-European war which the alignments of the cold war had suppressed. The second is that more European nations have the wealth and technical capabilities to field nuclear forces than nations in other interactive regions.

As a result, the nuclear question cannot be taken off the European security agenda by local decisions to abstain, as was done by Argentina and Brazil in their recent agreement, or by some European countries agreeing on a nuclear free zone. Nuclear and some non-nuclear weapon States in Europe would be necessarily involved in any major-Power confrontation. Thus, the management of nuclear deterrence and the question of who does the managing remain major policy issues for a number of States.

Costs and Risks of Nuclear Status

More immediately salient today than the possible benefits of nuclear deterrence, however, are the costs and risks inherent in obtaining nuclear status. The costs are diplomatic, economic and strategic. They vary from country to country, but they are very great in every case. In the case of Germany, its present status as an accepted leader of the world community and of Europe in particular would be at risk In fact, anything but whole-hearted cooperation in avoiding further nuclear weapons proliferation would have high costs associated with it for any European country. These costs of accession to nuclear status would be considered prohibitive by most foreseeable European leaderships, although the balance of positives and negatives associated with obtaining nuclear status would depend on the circumstances. A democratic Ukraine threatened by an autocratic, aggressive Russia, for instance, would bear lesser costs than a militarily resurgent Germany.

Under any circumstances, however, nuclear status for Ukraine, Germany, or, as the Mearsheimer scenario has it, Poland or Czechoslovakia, would not mean the same thing as nuclear status for France, the United Kingdom or China did. It would likely be far less of an element of great-Power status even in the dimension of security arrangements, far more of an indicator of transition to a troubling and poorly understood situation.

Desire to Participate in Nuclear Weapons Decision-Making

This desire is, and is likely to remain, a major factor, at least in determining the United Kingdom, French, German and possibly the Italian nuclear weapons policies. None of those countries is willing to cede authority for making decisions regarding nuclear weapons on a global scale to the United States, Russia and China, and on a European scale to the United States and Russia. On the contrary, there is a political impetus of several years' standing, manifested for instance in the Single European Act of 1987 and most recently reinforced at Maastricht, to unify West European foreign and security policy. While participation in nuclear weapons decisions need not always depend on having nuclear weapons or being in a nuclear alliance such as NATO, in decisions on such questions as whether and where nuclear weapons will be stationed in Europe, what the targeting and the degree of alertness will be, what provisions will be made for warning, command and control, safety, security, future production and reduction, doctrine for use or non-use, and the like, nuclear powers and NATO have the effective authority to date.

This constitutes a powerful incentive for the United Kingdom and France to remain nuclear powers, and for Germany (and perhaps Italy and other NATO members) to make sure either that NATO endures or else that they have a similar or greater voice in an alternative arrangement for managing nuclear weapons and other security and defence questions in Europe. If neither occurs, the desire to participate in decision-making on nuclear weapons, at least as it affects Europe, on a scale commensurate with its power will be a significant factor in what Germany does about nuclear weapons arrangements.

There is thus a tension between the perceived advantages of nuclear status (ultimate deterrent value, participation in decision-making) and the multidimensional costs of attaining that status. At the same time, nuclear weapons will continue to be perceived by most Governments of Europe as being important to their security. At present, three mechanisms are serious contenders for resolving this question in Western Europe, although variants and combinations of these three may also occur. The three are:

1 *Continuation of NATO,* which in effect means continued major United States participation in nuclear weapons decisions in Europe. Here the principal questions are the willingness of the United States to stay in Europe with nuclear weapons, and the willingness of Germany to participate in NATO nuclear activities, including the stationing of nuclear weapons on its soil. The arrangement is well-understood both by participants and outsiders, raises few questions of organisation or stability, and involves comparatively few political pitfalls. While NATO's *raison d'etre* has ostensibly vanished, NATO may survive just because it offers a relatively understood way to accomplish a goal several major powers want, the cooperative management of the nuclear question in Europe.

2 *Effective West European cooperation in nuclear weapons decision-making,* through either the Western European Union (WEU) or, more likely, EC. President Mitterrand of France and President Jacques Delors of EC have recently made statements favourable to this option. The historic desire of France to limit United States influence in Europe, coupled with a possible German desire to bring French nuclear forces under cooperative management, make this solution a politically possible

alternative to NATO. The United Kingdom, prizing its relationship with the United States, may continue to play a balancing game, combining cooperation with the French with support for NATO.

3 *Management by separate national entities,* with some more or less extensive overlay of Conference on Security and Co-operation in Europe (CSCE) or United Nations declarative policies. In earlier times, this outcome would have had to be considered the most likely one. National control could lead to further nuclear proliferation in Europe and would carry with it the seed of further instability, at least during the transition period while Germany and others were acquiring nuclear weapons. International relations however may have changed from their historic pattern in Western Europe at least, as Robert Jervis has noted. Opinion in France and elsewhere is divided on the subject of national control, but the drive to find a unified foreign and West-European defence policy to which we have alluded may tilt the scales away from this option. As Jervis also notes, the less the European nations believe that a serious threat will arise from within Europe, the less threatening their interdependence will be to them, and the more willing they will be to cooperate in this area as in others.

The CSCE or the United Nations or any agency springing from these are not included as major management options, because these organisations can only be charged with the management of nuclear weapons in Europe in a derivative sense. The ultimate power and responsibility will rest with one or other of the organisational frameworks listed above, because responsibility for the management of a nuclear weapons capability cannot be carried out apart from responsibility for the management of, first, a surrounding conventional force capability, command and control elements with both military and political reporting channels and, secondly, a supporting logistics, procurement, and R&D system and a base of taxation or other reliable means of assuring their long-term support. In the absence of these, any management system would be a creature of those sources of support.

In summary,If the perceived threats to Europe are viewed as coming from outside Europe, there is some likelihood of an EC or WEU alternative coming into being. This is also the case if the EC emerges as a more and more viable and active political actor on the world scene. If intra-European threats to the major European countries develop—not at present a likely eventuality—the national alternative seems likely to occur. If nothing much happens in the way of new threats, perhaps little besides talk will occur in the area of nuclear weapons management. In that case, NATO, as an existing organisation with which no one is too dissatisfied, may survive as a way to manage the details of the nuclear weapons question, and France may draw closer to NATO.

Numbers of nuclear weapons in the hands of France and the United Kingdom are not likely to go down during the present interim period. They may not go down at all until the United States and Russian numbers are considerably reduced. The United States and Soviet reductions in fact may revalue rather than devalue British and French stockpiles, as the two become more equal to those of the former Super-Powers.

Greater attention is being paid to command and control and security matters than ever before. More forces may go off alert status, for cost and security reasons. What to target is a question for all nuclear powers now. As alert levels are reduced, however, pre-targeting loses much of its saliency as a policy question. For nuclear weapons as for conventional weapons, lists of targets can be generated corresponding to the various war plans generated by military staffs, but weapons systems do not have to be pre-committed to any set of targets.

Elsewhere: New Aspects of Nuclear Deterrence

Perceptions of the stability of international relations in particular regions are likely to be the main determinants of the demand for nuclear weapons on the part of national governments in those regions. Three regions have been of particular concern on this score—the Middle East, South Asia and the Korean peninsula. In all three, nuclear supply restrictions imposed (with varying degrees of commitment) by the major powers have failed, and demand incentives and disincentives have been the dominant factors in determining the course of nuclear decision-making. We note also the progress which some regions (South America, South Africa), where the likelihood of dire outside threats has receded, have made towards eliminating nuclear weapons programmes.

This range of variations in underlying security situations makes it clear that analysing the future role of nuclear weapons in these various parts of the world cannot be treated within the confines of this article. We limit our consideration to two less-often-treated aspects of the subject, which bear on our main topic of the relation between international stability and nuclear weapons. The first is how nuclear deterrence may operate between a smaller and a larger Power or coalition. The second is what the general policy alternatives are for dealing with nuclear proliferation when the supply and demand incentives and disincentives usually applied fail.

It may be useful to begin by recalling certain facts and common assessments. A nuclear weapons programme is a medium-cost, medium-technology programme. The initial investment ranges from a few billions of dollars for a few weapons to tens or more billions (unless the weapons are bought or stolen). The nuclear materials, plutonium and enriched uranium, are the only unique, not widely available ingredients of these weapons, although other components can be traced through international trade. People in many countries know or can learn the technologies involved. The delays observed in some nuclear weapons programmes have had more to do with bureaucratic, political and social infrastructure impediments than with technical constraints. The means of targeting and delivering the weapons, if a country does not aspire to threaten countries on distant continents with massive attack, need not cost more nor be more demanding technologically than the weapons themselves. They need not be intercontinental ballistic missiles, for example: civil aircraft, ships, boats, trucks will do to threaten cities, where time and numbers of detonations are not of the essence.

A single nuclear explosion in the tens of kilotons yield range readily attainable in a first device can destroy a few square miles of a city, destroy or disable an aircraft carrier or similar ship within half a mile or more of the site of the explosion, destroy an airbase with all aircraft on the base, or destroy an array of military landing craft. Damage to non-targeted areas from a few such explosions, for example, from fires or fallout, would be limited and might be similar to levels of damage outside targeted areas in non-nuclear wars.

These features of nuclear weapons are well-known. They were not at the centre of attention for the United States-Soviet confrontation, where political attention was properly focused on the likely country- or world-wide devastation attendant on the detonation of hundreds or thousands of large-yield nuclear weapons. They may play a more central role, however, in future nuclear deterrent situations. Together, they imply that:

1. Nuclear weapons can be an equalizer against high-value, concentrated targets, such as the means of great-Power intervention. Only one weapon needs to get through defences to its target. Thus, even if defences are good, only a few weapons need to be allocated to each target. An airbase or an aircraft

carrier is thousands of times more valuable than the nuclear weapons needed to destroy it with high assurance. Advanced conventional, chemical and biological weapons, on the other hand, are difficult and expensive to deliver, requiring many sorties by skilled pilots and advanced aircraft for the same result, making them uncertain in their effectiveness against military targets.

2. At low or moderate levels of attack, with from a few to tens of weapons, it is feasible to restrict damage largely to military targets If that is desired. This applies particularly if the military targets attacked are intervention forces, operating initially from a few isolated airbases or from ships.

Both the "equalizing" feature of nuclear weapons and the possibility of using nuclear weapons as tactical deterrents may play a larger role in the future deterrent situations than they did in the past. In the United States-Soviet situation, nuclear weapons entered as one ingredient in a bilateral standoff between two very large, relatively distant and relatively stable polities. The United States and the Soviet Union were not usually vitally involved in the same areas. Germany may have been an exception, and the partition of Germany was accepted early on. Neither side had to win every battle: both had resources and opportunities to maintain its power despite occasional set-backs. Both were deterred by the immense difficulties that would have attended direct military action by either against the other, as well as by the threat of nuclear destruction. Neither was under domestic political pressure to win by war over its opponent, quite the reverse.

On the contrary, a nuclear confrontation in the Persian Gulf, for instance, could involve the perceived vital interests of both opponents. One or both might perceive that it would have to win to maintain its power. One of the polities involved might not be stable or well-informed. In these circumstances, nuclear deterrence might be perceived as less than a stable situation and, by the same token, might work against great-Power intervention.

An opponent with more time at his disposal than Saddam Hussein—who could have waited to invade Kuwait until he had perhaps tens of nuclear weapons at his disposal, some on Scuds or the like, some dispersed around the world on ships, civil aircraft, trucks or other places of which the United States had no knowledge—could have faced the possibility of intervention with nuclear deterrence at both tactical and strategic levels. "Attack my military forces, and I will retaliate against your military forces, with nuclear weapons if I must. The damage will be great but largely limited to fighting forces. I will not initiate an attack against cities. If you initiate attacks on our cities, not only will you reap the world's condemnation, but I will retaliate against some Western cities of my choosing." It is questionable whether any coalition would have held against this approach.

It can be argued that the United States and other advanced countries would not permit a situation to develop where a Saddam Hussein would have tens of deliverable nuclear weapons. The question is how to prevent it. So-called supply-side measures, inhibitions on the creation or transfer of nuclear and other needed materials, have and will continue to delay Governments seeking to make nuclear weapons. On the demand side also, a number of promising approaches exist: fostering regional security and arms control pacts, making sales of conventional arms and economic aid conditional on adherence to these pacts or to otherwise reasonable military postures. The United States, EC and Japan (which does not sell arms but does have the world's largest foreign aid programme) have all moved in that direction.

There remains however the clear possibility that these measures will not be enough. They would have to be applied by the major arms and economic aid suppliers to countries with which they have a wide spectrum of relations, and they would have to be perceived by the recipients as durable. A system of incentives and disincentives to curb nuclear weapon demand must be seen as effective, lasting and politically acceptable to countries as varied as Iran, North and South Korea, South Africa, the Central European countries, Israel and any other country which perceives that its vital interests may be threatened either by a neighbour or by one of the big powers, as well as to the supplier countries.

If, despite these supply and demand measures, a nuclear weapons programme develops in some country that is deemed to be a threat to peace, two general approaches may be identified. One is deterrence and containment, the other is forcible intervention. These approaches could be complementary but they may also be incompatible with each other. Deterrence and containment were, along with arms control, the tools used to limit the nuclear danger during the cold war. They require a clear commitment to the defence of vital areas, often manifested by the presence of forces in the areas before hostile action is initiated by the side to be deterred, and backed—at least tacitly—by the threat of nuclear force if the side to be deterred has nuclear weapons.

These steps are costly and often unpopular. Yet, historical studies of deterrence have concluded that deterrence works best when prior military commitments are visible and unmistakable. These studies have dealt with non-nuclear situations, but the nuclear weapon factor probably would reinforce that conclusion. Nuclear weapons are suited to reinforcing the status quo, making the expected risk of aggressive action both very high and very uncertain. They are not suited to aggression against a nuclear Power, because of the ease and devastating effectiveness of retaliation. Thus, nuclear weapons in essence help dissuade both sides from using force in vital areas.

In our example of a nuclear-armed Saddam Hussein, pre-positioning forces in Kuwait would have tended to have the same effect as did pre-positioning forces in Europe during the cold war. These pre-positioned forces would have made a quick victory by conventional means impossible. The putative Iraqi nuclear force would have had far less impact than if the nuclear Saddam had been able to face the United States with a *fait accompli* by means of a conventional invasion, as the non-nuclear Saddam did.

Containment goes hand in hand with deterrence. Containment has both military and economic dimensions. The military dimension comes into play after some degree of aggression has succeeded and further aggression is prevented by sufficient visible military commitments. Thus, if, in our example of a nuclear Saddam, aggression against Kuwait had not been prevented, further aggressions could have been contained militarily. The economic dimension is represented by the United Nations sanctions against Iraq or the cold-war economic isolation of the Soviet bloc from the Western economies.

Both deterrence and containment require long-term electoral support for cooperation, as distinct from dominance or unilateral action, whether it be intervention or withdrawal. There is evidence in the United States, EC and Japan at least that electorates will follow (and sometimes lead) their leaders in supporting such cooperation, but, since it is a long-term cooperative commitment of military forces and money, and since no single great Power is likely to get its way all the time, it is vulnerable to politics and bad times.

Armed intervention is the other possibility. It requires a clear unifying cause if it is to be compatible with international cooperation. The invasion of Kuwait provided such a cause in the case of Iraq, but in the long run a strategy of intervening with armed force to prevent proliferation is likely to be divisive as nations differ over whether such drastic means are warranted. Armed intervention thus probably puts at risk the possibility of cooperative deterrence and containment policies.

Armed intervention has several other drawbacks. It could give powers which might foresee future difficulties with the United States (or some other major Power) greater incentives to acquire nuclear weapons than would a strategy of deterrence and containment, in part because a nuclear capability, if it can be acquired, is more likely to be effective against a strategy of armed intervention than against a strategy of deterrence and containment. Thus, a strategy of armed intervention would be more vulnerable to partial failure than a strategy of deterrence and containment.

In addition, while armed intervention is not guaranteed to be successful, it is an act of war. Wars are among the most unpredictable of human activities. To use Iraq as a precedent for future interventions against third world powers is assuming that the next war will be like the last one. That assumption has usually been wrong. Armed intervention to curb nuclear proliferation would be an extremely risky policy.

Finally, the fact that nuclear weapons are at issue could tempt the interveners to use nuclear weapons first. It could also tempt interveners to broaden the category of weapons to be deterred by nuclear weapons to include chemical and biological weapons. Both tendencies are counter-productive from the standpoint of peace and non-proliferation. First-use of nuclear weapons provides an incentive to all nations to procure them if and while they can. It is a demonstration of their effectiveness and of the fragility of international covenants against their use.

In sum, in a world where security arrangements are more uncertain than they were, and a number of countries view themselves as threatened either by their neighbours or by the major powers, effectively enforced nuclear disarmament worldwide is unlikely. Such disarmament may not be possible so long as the possibility of wars involving the vital interests of any actor exists. Under these circumstances, nuclear deterrence may become both more popular and more unstable, and may be an effective equalizer for small powers against large powers.

A cooperative policy involving at least the major powers, attentive to both supply and demand factors for nuclear weapons, and therefore of necessity also eventually for conventional weapons, backed by deterrence and containment where necessary, is likely to serve the interests of peace and non-proliferation over the long run better than recourse to armed intervention. Such a policy would of necessity require more joint commitment to long-term objectives than has been the norm except where survival was threatened. In other words, the "crystal ball" which nuclear weapons conferred on the "cold warriors", permitting them to be steadfast in alliances and prudent and cautious in confrontation, will now have to extend to their policies towards the rest of the world if a race to nuclear armaments is to be avoided.

Policy Options for the USA

The prospective role of nuclear weapons, like much else in the prospects for international relations, depends to an important degree on United States policy choices. Put more starkly than is realistic for the sake of argument, the United States has three choices regarding security issues in general and nuclear security in particular: it can cling to the one-Super-Power approach to international relations; it can attempt to curtail its foreign security commitments much as the United Kingdom did after the Second World War; or it can attempt to move gradually from its present Super-Power position to one of leader of a grouping of like-minded States. While there is some overlap among these approaches, they also have defining distinctions. We will consider them primarily from the standpoint of nuclear security, with the understanding that nuclear security cannot be divorced from other aspects of security.

The first approach, in the nuclear area, would imply strong, if needed unilateral, United States action to prevent or minimise nuclear proliferation, together with pressure on the other nuclear powers to minimise or eliminate their arsenals. Moves by any nation to get nuclear weapons would be viewed as an attack on United States status rather than from a more general viewpoint of their effect on world stability. The United States would try to maintain an asymmetric advantage over Russia, perhaps by deploying defence.

This approach is unsustainable over the long or even the medium term. It would be in essence a return to older policies of national dominance and it would have the usual result of causing the other major powers to come together in some combinations to balance United States power. Thus, it could spur EC or WEU to form a more integrated policy, less cooperative with the United States than it would otherwise have been. It could tempt Russia to expand its power again, perhaps to the south as it has traditionally done. It could be likely to lead eventually to war if sustained to the extent that perceived vital security interests of other nations would be infringed. The approach implies that the United States would be the ultimate judge of the validity of these security interests, a position which other nations could not accept.

This approach could be dismissed out of hand as not likely to be supported by the American electorate if it were not for its possible perceived short-term economic benefits. If there are structural reasons for the current economic downturn, and if these are not remedied because the remedies are politically unpalatable, then increased government military expenditures, in the name of real or fancied security risks, could be seen as a way to rally political support, deflect criticism of current ills, and over the short term stimulate the economy. There could occur a situation in which bad times, an unreasonable fear of the proliferation of nuclear weapons and an unreasoned resentment of foreign economic competition could make an appeal to "remain number one" attractive and could gain electoral support in the United States for a more actively militaristic policy in a number of areas, including the nuclear area.

It is more likely however that this combination of factors could lead the United States into a period of retrenchment from international security activities. The wholesale retrenchment of a United Kingdom, which itself took many years, may not be in the cards soon, but there could be a diminished role for the United States abroad via a steeper than planned reduction in United States forces and a withdrawal of troops and security guarantees, for instance, from Europe and East Asia. To a degree, this is certain to occur in view of the end of the cold war. The main question is whether it will occur in cooperation with United States allies or despite their objections. The resolution of this question will affect such things as the future of NATO, and the nuclear policies of Germany, Japan, Russia and China. Without cooperation, the chances for international management of nuclear weapons questions are lessened, and of nuclear proliferation, especially among the larger powers, increased.

This leaves the third, and most difficult, approach as the most desirable one if the linked causes of stability, peace and nuclear non-proliferation are to be served. Cooperation is more frustrating than dominance or withdrawal. It requires more in the way of continued attention and political commitment. The alliances with NATO partners and Japan were difficult to manage politically during the cold war, when these alliances benefited from a politically widely accepted security rationale. The political commitment needed to manage nuclear questions cooperatively now will be even more demanding. Yet, the stakes are still very high. The other two approaches we have defined are likely to lead to serious misunderstandings among the major nations, the first because other nations are not likely to accept United States dominance for long, the second because a sudden transition from the present situation is likely to cause some overreactions abroad, which in turn will have their repercussions in the United States.

Conclusion

The return to a multilateral world order, with at least five, qualitatively different, major powers, at different stages of their history and with different world views, will put stresses on the strategic nuclear stability that has characterised the past 45 years. Yet, policies that will ensure, in actuality and perception, against threats to the autonomy and survival of nuclear and nuclear-capable nations are necessary if nuclear weapons are to remain in a deterrent, or stability-reinforcing, role, and not become a disastrously destabilising force. As we see from the foregoing brief survey, challenges to these policies arise all over the world, in the troubled CIS, in rapidly evolving East Asia, and, not least, in the parts of the world where the present major American and European powers have held sway historically over local polities.

We conclude where we began: the future role of nuclear weapons is hostage to perceived stable relations among the world's major powers and to lack of perceived serious threats among nuclear and non-nuclear powers. The word "perceived" refers here to the perceptions in the several Governments involved, not in the United States alone. In short, nuclear weapons must neither be forgotten nor be the cause of hysteria. Paradoxically, in order for nuclear weapons to remain in the background of relations among major powers, where all wish them to remain, maintaining cooperative management of questions relating to them and to central security generally must retain a high priority on the political agendas.

It is not likely to be true, as some have argued, that military security in the "first world" now takes a back seat to "economic security". Rather, they are different but essentially linked aspects of common security. So long as cooperation and perceived stability can be maintained, management of either can be carried out without interference from the other: in terms of the trillions in world trade, the costs of cooperative security and especially of cooperative nuclear security are minor. Mismanagement of either, however, carries serious risks of adversely affecting the possibility of managing the other successfully.

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DEVELOPMENT, PRODUCTION AND TESTING OF NUCLEAR WEAPONS

A. Decision-making Regarding the Development and Testing of Nuclear Weapons

The international community is divided on the issue of the possession of nuclear weapons. The overwhelming majority of States have refrained from acquiring such weapons. More than 45 years after the first nuclear devices were developed, only a small number of States have acquired nuclear arms. Significantly, more than 130 States, including three nuclear weapon States, in the Final Declaration of the 1985 Third Review Conference of the Non-Proliferation Treaty, declared their continued support for the prevention of proliferation of nuclear weapons or other nuclear explosive devices. It appears, therefore, that the vast majority of States believes that acquisition of nuclear weapons would not serve their security interests and that emergence of additional nuclear weapon States is liable to have considerable regional, or even global, security ramifications.

A decision to develop, build and test a nuclear weapon is complex. Following a political decision to acquire nuclear weapons, a non-nuclear -weapon State must develop the required technologies and ensure the supply of nuclear fissile material. Considerable research, development, engineering,' and industrial capacity are required to build facilities either to make enriched uranium or to extract Plutonium from spent reactor fuel. To build such facilities is a complex and expensive task, which is beyond the domestic capabilities of many countries.

After the decision has been made as to how to acquire the fissile material, a State must decide whether to test its developed weapon. It is probable that a workable first-generation fission weapon could be developed without testing, although it is uncertain how reliable this device would be. The Hiroshima bomb was not tested, and design and construction may well be easier today with the use of supercomputers. To develop advanced nuclear weapons, such as fusion weapons, would, however, require testing.

B. Nuclear Testing and its Relationship to the Continued Development of Warheads

The testing of nuclear warheads is a critical element in the production of nuclear weapons, because each new type of nuclear weapon typically requires the development of a new warhead. It is believed that most testing is done to develop specific new warheads, with half a dozen explosions required to develop a brand new design. Further tests are conducted to check weapons as they come off the production line, and also for their reliability when they reach the stockpile. Nuclear-test explosions are also used to research new kinds of nuclear weapons. "Weapons effects" tests are also carried out to measure the effect of radiation on military equipment. Most details of nuclear tests are kept secret.

All five nuclear weapon States conduct nuclear tests as part of their weapons programmes. Between 1945 and 1989 there were 1,819 internationally recorded tests (an average of one test every nine days) with a total yield of many hundred megatons (see table 1). Testing has been carried out on every continent except South America and Antarctica, as well as on a number of island territories in the Pacific Ocean. The United States, the Soviet Union and China test at isolated sites within their respective mainlands. The United Kingdom uses the American test site in Nevada. France has two test sites in French Polynesia.

Except for a few underwater tests, the early tests were carried out in the atmosphere, provoking widespread concern about the effects of radioactive fall-out. Since the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (PTBT), the United States, the Soviet Union and the United Kingdom have conducted their testing at underground sites. France continued to carry out atmospheric tests on French territory in the South Pacific till 1974 when it changed to underground testing only. China ended atmospheric testing in Sinkiang in 1980.

The nuclear weapon States have based their decisions to develop new nuclear weapons, upgrade and test new nuclear weapon systems on the following grounds: to ensure effectiveness of the nuclear deterrent by continued modernisation of the nuclear stockpile; to maintain the

TABLE 1

Recent Nuclear Testing Data

Country	*First test*	*Current test site*	*Number of test* 1986	1987	1988	1989	*All tests*
United States	1945	Nevada	14	14	14	11	921
Union of Soviet Socialists Republics	1949	Semipalatinsk/ Novaya Zemlya	0 a/	23	17	7	642
United Kingdom	1952	Nevada	1	1	0	1	42
France	1960	Mururoa/ Fangataufa	8	8	8	8	180
China	1964	Lop Nor, Sinkiang	0	1	1	0	34

a. The USSR held a moratorium on testing August,1985-February 1987.

reliability, survivability and safety of nuclear stockpiles; to allow the nuclear powers to subject command and control equipment to nuclear effects; to permit development of smaller warheads with potentially limited collateral effects.

The nuclear weapon States have used testing to amass a vast amount of weapons expertise and a wide range of nuclear weapons. They feel that nuclear weapons must be tested if they are to remain credible. While some nuclear explosions have been used to test trigger and safety mechanisms, many nuclear warhead components can be tested without an explosion.

C. Costs of Acquiring and Maintaining Nuclear Weapons

Both of the two previous United Nations studies on nuclear weapons (1968 and 1980) tried to estimate the costs associated with the acquisition of nuclear weapons by a State that decides on such an undertaking. The two studies agreed that a nuclear weapons programme would cost less in real terms to implement at their respective times of preparation than it did in 1945. This was attributed to technological progress in several fields, in conjunction with a wide dissemination of related knowledge within the framework of peaceful nuclear energy development. However, the two studies also agreed that any nuclear weapons programme would still be very expensive. The establishment and operation of a nuclear reactor or an enrichment plant or both would be very costly. The development of an advanced, dedicated delivery system might cost even more.

The costs of a nuclear reactor may be subdivided into three main categories: the cost of constructing the reactor, the fuel costs and the operational and maintenance costs. The cost of construction depends on the capacity, size, location, design and type of reactor to be built as well as on the availability of a skilled work force. Therefore, the investment cost for capital equipment is highly variable from reactor to reactor. The cost of fuel is more predictable, depending only upon price and quantity. Operational and maintenance costs also vary with the size and type of operation, although these costs are more stable from year to year.

The cost to a country of trying to develop and construct nuclear weapons and their delivery systems would be enormous and a call on the national budget that only a relatively small number of countries could sustain. Not only would a country have to divert a significant quantity of its human, technological and material resources to the project, but it would also have to devote its highest quality resources to this task. The infrastructure required to support a peaceful nuclear power programme is extensive; the demands of a nuclear weapons programme go well beyond that, particularly if the country has to develop an indigenous enrichment capacity to provide fissile materials for the weapons. Added to these already huge costs would be the expense of developing advanced dedicated delivery systems.

It is easier to construct and operate a dedicated plutonium production reactor than an electrical-power-producing reactor. Investment costs for the simplest type of graphite-moderated reactor giving enough plutonium-239 for two weapons annually (10 kg of plutonium) are estimated to be in the range of $25 to $50 million. The capital cost of a reprocessing plant to extract plutonium from irradiated fuel would amount to an additional $50 million. Personnel requirements for construction and operation are modest and plutonium could be produced four years after the start of the construction. In order to obtain plutonium for 10 to 20 weapons per year with a safe and reliable reactor, investment costs would range up to perhaps $1,000 million and the project would require some 50 to 75 engineers and 150 to 200 skilled technicians. The time span until the first output of plutonium would be five to seven years.

For an enrichment plant, costs may be categorised as for a reactor. The operational and maintenance costs are often proportional to the separation work actually done, which is indicative of the size and activity of the operation. This is often measured in mass separative work units (kg SWU) per time unit. The amount of separative work needed to produce a given quantity of enriched uranium depends on the type of plant, the quality of the "feed", i.e. the input, the level of enrichment of the final product and the residual U-235 content of the depleted "tails". For instance, to produce, in a certain plant, one kilogram of reactor fuel, enriched to 3 per cent from natural uranium with a 0.2 per cent uranium-235 content in the tails, 4.25 kg SWU is needed. To produce the same amount of weapon grade material under the same conditions requires 226 kg SWU.

Though costs can vary widely, all enrichment plants are expensive. In the United States, by the end of 1984, the total investment in plant and capital equipment for all three United States gaseous diffusion plants was $3.86 billion (an average of $1.28 billion each). According to unofficial sources, at the end of 1986, 2.59 million kg SWU went for United States defence activities, at the price of approximately $82-$100 per kg SWU.

Some academic sources estimate that the total amount world wide of weapon grade uranium produced since the Second World War ranges between 1,000 and 2,000 tons. Similarly, the total quantity of weapon-grade plutonium produced world wide amounts to 100-200 tons.

Currently, the United States is no longer producing enriched uranium for its nuclear weapons, since it has sufficient resources in its stockpile and in old weapons that it plans to scrap in the near future.

D. Peaceful Uses of Nuclear Explosive Devices

Since the advent of the nuclear age in 1945, the international community has sought both to use nuclear energy for peaceful purposes and at the same time to prevent the spread of nuclear weapons. The issue of peaceful nuclear explosions (PNEs) is closely connected with the pursuit of these two goals. While nuclear explosions have a potential of being carried out for civil purposes, the practical technical and economic benefits of such use of a nuclear device remain in doubt. Moreover, the prevalent view is that the technology for developing any explosive nuclear device is not distinguishable from that involved in the development of a nuclear weapon and that the explosion of such a device for peaceful purposes is indistinguishable from a nuclear weapon test. A non-nuclear weapon State capable of exploding a nuclear device could therefore emerge as a nuclear weapon State in a significantly shorter time. Two broad categories of potential peaceful use of nuclear explosive devices have been identified: (a) excavation and landscaping (e.g. canal and dam construction) and (b) contained application (e.g. curbing runaway gas well fires, stimulating oil and gas production, creating storage cavities and conducting deep seismic soundings). Soviet peaceful nuclear explosions have encompassed all of the uses described above.

The United States and the Soviet Union, hopeful of achieving technical success and economic advantages from peaceful nuclear explosions, each began conducting PNE-related test explosions in the 1960s. France carried out research or peaceful nuclear explosions but did not conduct any tests. China and the United Kingdom have never expressed any interest in peaceful nuclear explosions, and there are no indications that they have ever had such programmes. In 1974, India announced that it had carried out a peaceful nuclear explosion; it is the only non-nuclear weapon State to have done so. This event aroused concern among other countries.

The United States peaceful nuclear explosions programme, established in 1957, consisted of an active research and development effort and 12 actual nuclear field tests to investigate possible uses for gas stimulation and large-scale excavation. The advantages of using nuclear explosions for these purposes were not demonstrated by the programme. Because of this and the increasing public concern for the environment and possible increases in radioactivity, the United States terminated its programme in 1977.

The first explosives used in the United States peaceful nuclear explosions programme were existing nuclear weapons modified to meet underground emplacement conditions. As experimental data became available, however, it became clear that the United States peaceful nuclear explosion devices would require special characteristics to minimise health and safety effects; these characteristics would include low-fission explosives for excavation and all-fission devices to minimise residual tritium for use in oil and gas stimulation. All testing of the devices was done at national test sites, while the analysis of each event focused on whether the device performed as expected and what radioactive elements were present.

The Soviet Union also had an active peaceful nuclear explosions programme, conducting over 100 detonations since 1965. However, the programme has been seriously scaled back. Excavation applications apparently were abandoned a decade ago, owing to discouraging experimental results and strong public objections on environmental grounds. The main Soviet efforts now seem to focus on creating underground facilities for storage of gas condensate and conducting deep seismic soundings.

Five major treaties on arms limitation and disarmament deal in whole or in part with the issue of peaceful nuclear explosions, all attesting to the similarity of nuclear explosive devices for military and for peaceful purposes.

The original optimism on the possible benefits of the PNE technology has now been reversed. The combination of environmental problems, delicate arms control issues, cost and security and safety problems have all contributed to a common understanding that the PNE technology is generally impractical.

E. Physical, Medical and Environmental Effects of Nuclear Weapons Production

The complete nuclear weapons production cycle comprises many operations, i.e. mining and milling of uranium, uranium enrichment, reactor fuel fabrication, operation of reactors for plutonium production, spent fuel reprocessing, weapons manufacture, handling of weapons, dismantling of weapons and final disposal of waste. Many of these operations are also common to civilian use of nuclear energy. Most, if not all of them, are associated with possible risks to the personnel involved and to the environment. Accidental releases of radioactive substances and chemicals during ongoing processes or by effluents, transports and so on resulting from mismanagement of wastes may cause environmental damage.

The United States nuclear warhead production industry currently consists of 17 major facilities in 13 states.

There has been increased scrutiny by the United States of its nuclear reactors used to produce materials for nuclear weapons, revealing safety concerns at a number of the United States nuclear-material-production facilities. Therefore, all of the United States Department of Energy's nuclear weapons-material-producing reactors have been shut down as at early 1990. As a result, the United States has not produced any new tritium since at least June 1988, as the Department's three operational tritium production reactors at the Savannah River facility, in the state of South Carolina, have all been shut down.

The United States is estimated to have about 500 metric tons of weapon-grade uranium, enough to support all existing United States/ nuclear weapons. In 1964, President Lyndon Johnson decided that the United States stockpile of highly enriched uranium was sufficient to support American nuclear weapons requirements. Since then the United States has not produced any additional highly enriched uranium for weapon.

The United States currently has about 100 metric tons of plutonium, enough to support its current stockpile of nuclear weapons. In addition to the plutonium in existing nuclear warheads, the United States has reserve and scrap plutonium that could, depending on modernisation requirements and retirements, continue to support a nuclear arsenal for some time. United States legislation prohibits diversion of plutonium from civilian power plants to weapons use.

The Soviet Union is thought to have built a total of 14 military nuclear reactors, the same number that the United States originally built. Four of them have been closed down. The 10 Soviet reactors that are still in service will soon have been operating for about the same length of time as United States military reactors, before the United States reactors were shut down.

The Soviet Union has announced that in 1989 it stopped production of enriched uranium, that it closed in 1987 one reactor that was producing weapon-grade plutonium and that it plans to close down in 1989-1990 a few more such reactors. In 1989, the Soviet Union announced that it planned to decommission by the year 2000 all plutonium-producing reactors. Four reactors producing weapon-grade plutonium in the vicinity of Kyshtym will be shut down by the end of 1990. Out of six plutonium-producing reactors that will still be operating, three reactors will be closed by 1996 and the last three before the year 2000.

The Soviet Union has also been experiencing difficulties with its nuclear weapons production facilities. It has been reported that the Kyshtym Industrial Complex, established in 1946 and therefore the oldest nuclear weapons production facility in the Soviet Union, was experiencing difficulties similar to those of its American counterparts. The plant has experienced severe radioactive and toxic pollution, critical mechanical lapses and public fears about health threats. This is not a new problem for the Soviet Union. Mismanagement of nuclear waste caused a huge explosion there in 1957 that showered hundreds of square miles with dangerous radioactive particles. It forced the evacuation of more than 10,000 people and created a radioactive zone 65 miles long and almost 6 miles wide. In addition, the Soviet Union poured caesium, strontium and other nuclear wastes directly into a lake within the complex, making it unfit for human use. More than 30 years later water reserves in the surrounding area are still undrinkable.

The 1957 accident at Kyshtym, which was described in detail by the Soviet press 32 years later, coupled with the accident at Chernobyl, in April 1986, has also caused popular anxiety in the Soviet Union about nuclear technology. As a result of various incidents, both in the Soviet Union and in the United States, domestic concerns about the dangers people face from the weapons industry have begun to enter the debate about the safety of nuclear facilities.

These concerns have prompted the United States Department of Energy to propose spending $28.6 billion over the next five years to correct the conditions at civil and military nuclear sites around the United States. The money would be used to clean up pollution, to repair equipment and for research to develop new methods to dispose of radioactive and chemical waste. The plan is intended to correct nuclear and chemical contamination and repair damage at 94 nuclear sites in 19 states in the United States, of which 72 are no longer active.

Under the plan, at least $13 billion is to be spent on the disposal of low-and high-level radioactive wastes. The low-level waste includes cardboard boxes, gloves and other material contaminated with radioactive substances, which are not acutely harmful but can be dangerous with long-term exposure. The high-level waste consists of radioactive elements like caesium and strontium. Most of these wastes are stored as liquids. They emit penetrating radiation that can be lethal near the storage vessels even after very short exposure.

Among the problems identified at United States nuclear weapons production plants were: (a) releases of radio-nuclides and other harmful substances into the air, water and soil; (b) plants run without adequate worker protection or safety precautions; (c) toxic and radioactive waste accumulating in thousands of dump sites; and (d) hazardous materials being unsafely transported through heavily populated sections of major American cities.

There is little information as to whether the other three nuclear weapon States are having any problems with their military' reactors on a scale similar to those being experienced by the United States and the Soviet Union. However, the United Kingdom has experienced some contamination, on at least one occasion, from a reactor used for production of weapon-grade fissile material. France has not met with any similar difficulties, according to French officials.

F. Physical, Medical and Environmental Effects of Testing

Radioactive materials from atmospheric testing occasionally caused strong local contamination and were also distributed globally. However, since the signing of the PTBT, the United Kingdom, the Soviet Union and the United States have" not conducted atmospheric tests.

Continued testing throughout the 1950s spread radioactive substances over Utah and Nevada and over ships and islands in the Pacific near the Bikini Atoll tests. Army troops were also placed near the atomic test sites in 1952 and 1953 as part of an exercise to test the effects of the use of nuclear weapons on combat readiness. A higher incidence of cancer has been reported in these troops, although an explicit link to the tests has not been established. The concern about this global contamination led the United Nations to establish in 1955 the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). This Committee has reported to the General Assembly on a regular basis on the levels of contamination and the associated health effects.

Fall-out has affected test areas, some of which have not yet been restored to safe, habitable conditions. Different components in the fall-out from a nuclear test remain radioactive for periods varying from a few/days to many millennia. Despite precautions being taken, weather conditions occasionally led to significant amounts of radioactive material being carried to nearby inhabited regions. Some biological effects of the testing have been clearly demonstrated, such as the thyroid tumours following exposure after atmospheric tests of children on the Marshall Islands. Other alleged effects of exposure on, for example, troops from the United States and the United Kingdom, and of the population in the contaminated areas in the vicinity of the test sites are still being studied.

The effects of underground testing depend on the yield and depth of the blast as well as the geological character of the test site. The bulk of the radioactive debris is trapped within vitrified rock, which is formed in the explosion chamber during the test. Immediate releases of radioactive substances can occur by the venting of gas to the surface through the shattered rock above the chamber. While it is normal for rigorous safety precautions to be in force at underground test sites, instances of venting, of varying seriousness, have occurred. The health of test site workers, who work in close proximity to a range of radiation hazards, is closely monitored.

For testing to be safe in the longer term, rock formations at test sites must be sound enough to prevent the leakage of high-grade radioactive material into the ground water over several thousand years. Critical factors include the leachability of the radioactive waste, the flow rate of the ground water, the absorption character of surrounding rock and the isolation of the site itself. Scientific studies have reached various conclusions on the likelihood and severity of future leakages. However, there is a natural and widespread concern that test sites may not prove able to contain radioactive waste and that serious leaks could have environmental and medical consequences.

Underground nuclear tests also produce geological disturbances. The underground cavity formed by the explosion soon collapses, causing some surface disturbance. Seismic waves from the blast may affect the whole test site, adding to concerns about its long-term integrity and causing other damage in some cases, such as marine landslides. Small seismic waves can be detected from great distances. However, underground nuclear tests are not thought to trigger larger earthquakes.

There are two test sites in the Soviet Union for the conduct of nuclear tests—one near the town of Semipalatinsk (Kazakhstan) and one on the island of Novaya Zemlya, between the Barents Sea and the Kara Sea in the Arctic Ocean. The first Soviet atomic bomb was exploded at the Semipalatinsk site in 1949 and in 1953 a hydrogen bomb was exploded there. Prior to 1963, atmospheric nuclear tests were carried out at that site.

In 1989, two commissions of experts were established at the request of public organisations in Kazakhstan, and they have brought to light a number of factors reflecting the adverse effect of tests on the population and on plant and animal life in areas of Kazakhstan adjacent to the test site. In particular, it has been determined that during the 14-year period when atmospheric tests were conducted, approximately 10,000 people were exposed to radiation in areas immediately adjacent to the test site. Among these 10,000, the average equivalent dose varied from 0.02 to 1.6 sievert (Sv), The remaining population received less than 0.02 Sv. (As a comparison, for a professional who has to deal with ionizing radiation, an equivalent dose of up to 0.05 Sv over a year is not considered to be a health hazard, according to current international standards.)

Between 1959 and 1987 the mortality rate from leukaemia tripled in the Semipalatinsk region. Birth defects resulted in a significant increase in infant mortality. The incidence of births of children with subsequent mental retardation was three to five times higher in the areas adjacent to the test site than in the country as a whole. In a sample survey of the population conducted in 1989, almost half those examined showed decreased immunological resistance. As early as 1962, a medical commission of the Academy of Sciences of the Kazakh SSR established that the incidence of malignant tumours in the Semipalatinsk region was 35 per cent higher than average for the Republic.

Following the conversion of the Semipalatinsk test site to use solely for underground tests, the radiation situation improved significantly. The level of background radiation is now almost the same as natural background radiation.

Nevertheless, after each underground nuclear explosion, water is lost from the wells and water supply and sewage pipes burst. Cracks appear in the walls of buildings. Even today, unusually large numbers of people are treated in polyclinics and both children and teachers show a sharply reduced ability to work.

The United States test area is situated in Nevada. Early United States nuclear tests had been carried out in New Mexico, Mississippi, Colorado, in the central Pacific on atolls in the Marshall Islands, the Northern Line Islands and in the Aleutian Islands. The Nevada test site was chosen as a continental proving ground in December 1950 to reduce the expense and logistic problems of testing in the Pacific.

The Nevada test site has been used for both atmospheric and underground testing. It has been reported that in the 1950s and 1960s employees at the site had been exposed to dangerous levels of radiation during post-explosion work. The Office of Technological Assessment has also disclosed that 126 underground tests since 1970 have released roughly 54,000 curies of radiation, which is only a very small release compared with that emanating from an atmospheric explosion. The Office has concluded that these releases from underground tests have not jeopardised the health of nearby residents.

The United Kingdom uses the Nevada test site for its underground tests. Early United Kingdom tests had been carried out in the central Pacific and in Australia. There is little information available about the conditions at the Chinese test site at Lop Nor in Singkiang. The testing base covers an area of more than 100,000 km in the Gobi desert. Both atmospheric and underground tests have been conducted there.

Nuclear testing in the South Pacific has become an area of contention between some of the nuclear weapon States and a number of South Pacific States. French nuclear testing takes place on the atolls of Mururoa and Fangataufa in the territory of French Polynesia. France began atmospheric testing there in 1966, switching to underground testing alone in 1974. Recently, France announced that its test programme would be reduced from eight to six tests annually and the level of secrecy surrounding the programme would be reduced.

There has been a long international debate about the safety and desirability of French tests. France says that testing is necessary to ensure the effectiveness of its nuclear forces. It is satisfied that the testing programme is safe. The test sites are isolated (1,500 people live in a 500 km radius) and a variety of safety precautions have been taken.

French nuclear testing is a matter of concern to most South Pacific countries. They strongly object to manifestations of nuclear weaponry in the South Pacific, a sentiment reflected in the Treaty of Rarotonga and have made many calls for France to stop testing in the region. In

1973, upon the request of Australia and New Zealand, the International Court of Justice indicated that the Government of France should avoid nuclear tests causing the deposit of radioactive fall-out on the territory of Australia, New Zealand, the Cook Islands, Niue or the Tokelau Islands. However, in 1974 the Court found that France had entered into a commitment not to carry out atmospheric tests in the South Pacific and that, accordingly, the Australian and Mew Zealand claims no longer had any object. Concerns continue to be expressed about the environmental and health effects of French underground testing. In particular, some scientists feel there is a significant risk of radioactivity leaking into the surrounding ocean over time. However, France has allowed several independent studies which have shown no significant radioactive pollution of the areas investigated.

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EFFECTS OF THE USE OF NUCLEAR WEAPONS AND CONSEQUENCES OF NUCLEAR WAR

A. General

The existing knowledge of the effects of the use of nuclear weapons is far from complete. In only two instances were nuclear weapons used in actual war conditions, against the Japanese cities of Hiroshima and Nagasaki in 1945. The outcome of these explosions has been painstakingly investigated, yet considerably different data are given by different sources, in particular with regard to the number of casualties. Even in recent years, new findings have been brought to light about the detailed effects of the 'bombings of Japan.'

The studies on the effects of a nuclear war are generally based on data from Hiroshima and Nagasaki, nuclear weapon testing and extrapolations or scientific hypotheses that by definition cannot be verified. Irrespective of the sophistication of the various models applied in the different studies, it should be borne in mind that no desk calculations could give a true picture of the consequences of nuclear warfare. The accounts given below should, therefore, be considered only as indications of the magnitude of the effects of nuclear war as described in these studies.

Studies carried out to determine the effects of the use of nuclear weapons have all used different war scenarios and applied various other assumptions. The scenarios ranged from the explosion of one nuclear weapon to an all-out nuclear exchange. Apart from the number of weapons used, other scenario parameters are, for instance, the explosive yield and height of burst of the individual weapons, the character of their targets, especially the population density in the target area, and climate and weather conditions. The results have usually been presented as estimates of the number of people killed and injured, as well as of material damage to built-up areas, loss of industrial capacity, and so forth.

Should large numbers of nuclear weapons ever be used, the total effect would be much larger and more complex than the sum of individual cases. Immediate damage may be enhanced by interactions of a direct and physical nature. Important additional uncertainties pertain to the overall social, economic and political aftermath of the sudden and widespread devastation that a nuclear war would entail. There are also, long-term, large-scale physical consequences, including climatic effects, of a war involving many nuclear explosions. All of these large-scale consequences will affect non-combatant nations, partially on a global scale, for a long time after the war.

B. Effects of One Nuclear Explosion

The explosion of a nuclear weapon causes damage in several ways: intense thermal radiation, a powerful blast wave and nuclear radiation from the fireball end from radioactive fall-out. There is also a pulse of electromagnetic radiation harmful to electrical systems. Of these, the fall-out has a delayed effect, while all the others are immediate.

When a nuclear weapon is exploded above ground, the first noticeable effect is a blinding flash of intense white light. The light is emitted from the surface of the "fireball", a roughly spherical mass of very hot air (the temperature is of the order of 10 million°C) and weapon residues, which develops quickly around the exploding weapon and continues to grow until it reaches a maximum radius, which depends on the yield. During this time, and for some time after, the fireball emits thermal radiation both as light and—mainly—heat. When the fireball rises, it cools off and is gradually transformed into a huge mushroom-shaped cloud. A column of dust and smoke sucked up from the ground forms the stem of the mushroom. After some 10 minutes, when the cloud is fully developed, it will have a height and a diameter of several kilometres, dependent on the yield. By then, about one third of the explosive energy has been released as heat.

Thermal Radiation

The effects of thermal radiation would be manifold. Within and close to the fireball, everything would be vaporised or melt. The thermal radiation could—be expected to kill or severely injure people directly exposed to it at relatively large distances. Materials that are easily ignited, such as thin fabrics, study or dry leaves, may catch fire at even longer distances. This may cause numerous additional fires, which under some conditions may form a huge fire storm enveloping much of the target area and adding numerous further casualties. That was the case in Hiroshima, although it is considered less likely in modern cities.

Air Blast

The blast wave carries about half the explosive energy and travels much slower than the various forms of radiation, but always at supersonic speed. The arrival of the blast wave is experienced as a sudden and shattering blow, immediately followed by a hurricane-force wind directed outwards from the explosion. Near the explosion, virtually all buildings would be utterly demolished and people inside them killed. At somewhat larger distances, ordinary buildings would be crushed or heavily damaged by the compressional load as they would be engulfed by the blast overpressure and the wind drag. People inside could be crushed under the weight of the falling buildings, hurt by the flying debris of broken windows, furniture, etc., or even suffocated by the dense dust of crushed brick and mortar. All the primary blast destruction would take place during a few seconds.

Some of the energy in the blast is transferred to the ground, creating a shock wave in the underlying soil or rock strong enough to damage even fortified underground structures. The transfer of energy would become more efficient the closer to ground level the explosion occurs.

Nuclear Radiation

Before any visible phenomena occur, the exploding device starts to emit an intense burst of neutrons and gamma rays. Virtually all of this radiation is released during the first one or two seconds. It is rapidly attenuated with distance as it travels through the air. For an explosion similar to those over Hiroshima or Nagasaki, this radiation is strong enough to render human beings in the open unconscious within minutes at distances up to 700 or 800 m from ground-zero. The exposed persons, if they survive the blast and heat, would die in less than one or two days from the radiation injury. The radiation received at a distance of 1,300-1,400 m from such an explosion would also be fatal but death may be delayed up to about a month. At 1,800 m or more from ground-zero few if any acute radiation injuries would be expected to occur. However, late radiation injuries may be induced by lower radiation levels. In addition, acute radiation sickness caused by non-lethal doses could trail off with a state of general weakness protracted over months and years.

Electromagnetic Pulse

Simultaneously, a small part of the gamma ray energy is converted to electromagnetic energy through interaction with the surrounding air and develops a strong electromagnetic field, which is also propagated outwards. This phenomenon, known as electromagnetic pulse (EMP), takes the form of a very short burst of electromagnetic waves in the radio frequency spectrum, up to at least 1 MHz, which trails off within about one thousandth of a second. Electronic equipment might suffer EMP damage even if it were not connected to any antennae.

Nuclear Fall-Out

The fireball, and later the cloud, contains most of the radioactive atoms, mostly fission products, that were formed in the explosion. While the total weight of these fragments is small, about 1 kg, their combined activity one hour after the explosion equals that of several thousand tons of radium (although the emitted radiation is somewhat different). This activity decays rapidly, however; during the first two weeks it decreases to one thousandth of what it was one hour after the explosion. As the cloud develops, the radioactive atoms are incorporated in larger particles formed by condensing vapours and mixed-in dust and dirt. The range of the radiation is relatively short compared to either the height of the cloud base or the size of the devastated area. For this reason, the radioactive particles in the cloud do not constitute a health hazard until they are deposited on the ground as radioactive fall-out.

The radioactive cloud drifts, changes shape and eventually disintegrates under the action of the winds at those altitudes where it is stabilised. At the same time, the particles carrying the activity subside with speeds that depend strongly on their size. In the case of an air burst, most particles will be very small and it may take from days to years for them to reach the ground. By that time they have lost most of their activity and have been scattered over a wide area. Fall-out over intermediate times may be denoted tropospheric, while the very slow deposition of particles injected into the stratosphere is usually referred to as global fall-out. This fall-out radiation does not cause any acute ill effects, but over the decades to follow it will contribute to the occurrence of "late effects" (additional cancers and genetic injuries).

When the nuclear weapon explodes at or close to the ground, with the fireball in direct contact with the surface, thousands of tons of soil are injected into the hot vapours. Large (diameters up to one millimetre or more) particles then carry a significant part of the residual activity. These particles come down to earth in a matter of hours or even minutes and create an intensely radioactive contamination field in the downwind vicinity of ground-zero. This so-called immediate fall-out gives rise to acutely lethal radiation doses for unprotected people over large areas. The possibility of late radiation injuries in this area is also much larger than in the case of an air burst.

The size of the areas affected by the various effects described above will depend primarily on the explosive yield and the height above the ground of the explosion. It is also influenced by other factors specific to each situation such as weather conditions. Some of these factors are not yet fully understood. Wind velocity is particularly important for fall-out.

It is generally considered that the area on the ground affected immediately would be circular. Its size increases with increasing yield but in less than direct proportion to it. Roughly, ten-fold or hundred-fold increases in the yield produce five-fold and twenty-fold increases respectively in the area devastated by air blast. The area exposed to a certain level of thermal radiation increases more rapidly with yield than does that affected by air blast. This implies that thermal effects — fires and burns—will become progressively more dominant with increasing weapon yields. Conversely, the initial nuclear radiation loses most of its importance when the yield increases.

Areas of damage caused by different effects will vary with the height of burst, generally decreasing somewhat with decreasing height. These variations are relatively unimportant in comparison to the most dramatic additional effect of explosions close to the ground surface, i.e. the generation of local radioactive fall-out, as described above. In a matter of hours, the fall-out will contaminate an area downwind of the explosion that is very large compared to that affected by blast and heat. The size of the contaminated area is expected to be roughly proportional to the fraction of the explosive yield due to fission, although the actual distribution of fall-out is determined by winds and precipitation.

Another influence of variations in the height of burst relates to EMP. Surface or low air bursts will generate EMP that may have harmful effects on electrical and electronic equipment out to a distance of about 3-10 km from ground-zero, depending on the explosion yield and the equipment sensitivity. The strength of the EMP at the ground will then decrease with increasing height of burst up to an altitude of 10 to

15 km. When bursts occur at still higher altitudes, a strong EMP will again be experienced on the ground. This is due to the combined effects of atmospheric density variation in the altitude and the geomagnetic field. This EMP covers a wide area, since it extends outwards in all directions as far as the line of sight from the burst point. A nuclear explosion at an altitude of 80 km would affect a circular area with a radius of about 1,000 km. Thus, a high altitude burst might cause EMP damage over entire countries while all other effects (except possibly flash blindness at night) would be negligible.

C. Levels of Immediate Destruction in Various Scenarios

1. Effects of a Nuclear Explosion Over Cities

Many of the studies referred to above have described the immediate consequences of nuclear air bursts—often with high explosive yields—over large cities. The number of fatalities and level of destruction in such a scenario depend on many factors, including the size of the city and the distribution of its population in relation to weapon yield, the height of burst and ground-zero location.

That one nuclear weapon of relatively low yield can destroy a city of intermediate size and kill a large portion of its population was convincingly demonstrated in August 1945. The actual numbers of people killed or injured in Hiroshima and Nagasaki are still under debate. In the case of Hiroshima, between 310,000 and 320,000 people were exposed to the various effects of the atomic explosion. Of these, between 130,000 and 150,000 had died by December 1945 and an estimated 200,000 by 1950, if latent effects are included. In Nagasaki, the corresponding numbers are 270,000-280,000, 60,000-80,000 and 100,000.

The 1980 United Nations study reported the consequences of a 100 kt low airburst over the centre of a European city with 0.5-1 million inhabitants. Scientists had estimated that such an explosion could kill up to half the population, that at least half of all buildings within a radius of 5-6 km would be destroyed by blast, and that roughly that same area might be ablaze with fires within an hour after the explosion.

Possible consequences of megaton explosions over large cities were summarised the United Nations study in 1980. The United States Congress Office of Technology Assessment (OTA) in 1979 and the World Health Organisation in 1984, as well as several independent organisations, have also dealt with the subject. Assuming only airbursts, which means disregarding the possibility of local fall-out with its associated additional casualties, the following table summarises the Table 1.

As another example, an independent study group at Princeton estimated the casualties that would result if the 100 most populated regions in the United States and the Soviet Union were exposed to one 1 Mt airburst each. This was estimated to cause up to more than 70 million casualties, of which about 90 per cent would be killed outright, in the United States and even larger numbers in the Soviet Union. The resulting numbers; nay vary by a factor of up to 2, depending on what type of model is being used.

TABLE 1

City	*Weapon yield (Megatons)*	*Casualties (Millions)*		*Source*
		Killed	*Total*	
Detroit	1	0.5	1.1	OTA 1979
Leningrad	1	1.0	2.0	OTA 1979
New York	15		5-10	United Nations 1980
London	1	1.6	3.2	WHO 1987

2. Consequences of a Nuclear Exchange

Most studies of the possible consequences of a nuclear exchange assume that a multitude of nuclear weapons are employed. These studies have some general points in common: (a) in any densely populated area, the ratio of civilians to military among those killed and injured would be very high; and (b) if ground bursts occurred, the number of casualties would rise significantly, owing to radiation injuries, since adequate shelters would not be available. The higher the yields of the explosions at ground surface the more important fall-out becomes. The number of civilians killed or injured by fall-out could far outnumber those affected by blast and heat.

Several studies have considered the consequences of a nuclear war in which all the weapons used are "tactical", having yields from 1 kt to some 100 kt, and are aimed at military targets. In some European scenarios, the number of explosions has been taken to be more than one thousand, with a combined yield in the range of 20-100 Mt, and the number of early deaths among civilians has been estimated to be between 10 and 20 million.

Many studies of a major nuclear exchange, involving large numbers of strategic warheads, have been carried out, particularly in the United

States. In these studies various scenarios have been described, generally categorised as either counter-force or counter-value strikes.

In a counter-force strike, surface bursts would probably be used in large numbers, as they maximise the probability of destroying hard military targets, e.g. ICBM silos. The major cause of civilian casualties would then be early fall-out. Attacks against strategic bomber bases and strategic submarine bases might use air bursts and, to the extent that these facilities were located close to population centres, blast and thermal effects would cause considerable damage in such areas.

The United States Congressional Office of Technology Assessment (OTA) study published in 1979 quotes United States government studies indicating that between 2 and 20 million Americans would be killed within 30 days after a counter-silo attack on the United States ICBM sites. The same study concludes that a comprehensive counter-force attack on the United States would produce about 14 million dead even if the present fall-out shelter capability were utilised. A United States counter-force strike against the Soviet Union would result in somewhat similar numbers of casualties, according to OTA. The majority of fatalities within 30 days of a counter-force attack would be caused by radiation due to early fall-out from surface bursts. Other studies are in approximate agreement with these results. In the studies referred to above, extensive sheltering of the civilian population is assumed. An uninterrupted stay in shelter during several weeks would be required to avoid still larger casualties. This would cause serious problems of sanitation, food and water supply, air filtration, health, communication to the outer world, psychological tensions, and so on.

After a counter-force strike, economic activities, especially in contaminated areas, would be disrupted for months and perhaps years. Furthermore, radioactive fall-out would cause serious problems to agriculture. Livestock would have little protection against fall-out. A severe decline in the supply of meat and dairy products would therefore result after a certain period of time and many years would be required to build up new livestock. Radiation effects on crops would depend on the season, an attack in spring causing more damage than one in the summer or early autumn. Radioactive elements filtering down into the ground water would be taken up by plants and, through grazing, by cattle and other animals. Quantities of radioactive substances could then enter the human system through consumption of foodstuffs from contaminated areas and contribute to the total number of late radiation injuries

The national capacity for food production, processing and distribution would probably be even more severely affected by an extensive counter-value attack than by a counter-force strike. Destruction of storage facilities, processing plants and transport facilities would result in a general food shortage within a short period of time. The destruction of virtually all petroleum refinery capacity, pipeline systems, and so on would have immediate consequences for transportation, heating and electrical power production. A counter-value attack could well entail the successive decay, if not the complete collapse, of social and political institutions.

The task of the survivors after a large nuclear war would be beyond our comprehension and they could face the complete breakdown of international order. In these circumstances reconstruction might be all but impossible.

3. Consequences of Damaging Nuclear Installations

The possibility must be taken into account that nuclear power industry installations, such as nuclear reactors, reprocessing plants or storage for spent nuclear fuel and radioactive waste, might be hit by nuclear explosions. Should this happen, most or all of their radioactive content might be surged into the explosion and add to the fall-out from the explosion itself. If one or a few such installations were destroyed, the additional amount of radioactive substances released would be limited. If, however, such installations were systematically targeted, the additional amount of radioactive substances released would be very substantial.

The production rate of radioactive substances in a 1,000 MW nuclear electrical generating station is equal to that of one 60 kt atomic bomb every day, but after some time of reactor operation most of the short-life radiation would be limited to their saturation levels and the long-life radiation would dominate. In reprocessing plants and waste storages, only long-life radioactivity would remain. Because of this equilibrium, the activity released from a reactor would become gradually more important in comparison to that contained in the explosion debris as time goes by.

Systematic destruction of nuclear facilities would thus add marginally to the short-term radiation after the attacks, but after a week or so, the contribution from destroyed facilities to the radiation effects would dominate. In areas with many nuclear installations, like Europe, North America and Japan, destruction of these facilities would make large areas uninhabitable for a century or more. Comparison could be made with the Chernobyl accident, where part of the radioactive content of one reactor was released without the driving force of a nuclear explosion.

D. Medical Effects

During the 1980s, considerable attention was given to the study and description of the medical aspects of nuclear war. Generally speaking, injuries related to nuclear explosions fall into three groups—mechanical, thermal and radiation-induced—although all kinds of combinations are likely. Psychological effects would be likely to add to social disruption in a nuclear exchange. Mechanical injuries (fractures, soft tissue wounds, crush injuries) as well as thermal injuries, (burns), are well known to medical science in general. In a nuclear context, though, problems would arise from the huge numbers of casualties and lack of resources. Acute radiation injuries, on the other hand, are uncommon in peacetime. The symptoms are often unspecific, at least initially, rendering the diagnosis uncertain. No specific remedies exist. In addition, delayed effects of radiation are quite different from acute radiation illness.

1. Mechanical and Thermal Injuries

An explosion may cause mechanical injury by overpressure acting directly on the human body or by causing the person to be swept away or dragged by the blast wind and thrown against a hard surface. The number of casualties is likely to be much higher after a nuclear explosion over a built-up area as a result of heavier material destruction, such as collapsing building structures, flying debris, and so forth.

Thermal injuries are mainly skin burns caused by the heat radiation (flash burns) or by fires ignited by this radiation (flame burns). In addition, the flash of heat and light might cause injuries to the eyes. Internal burns from inhalation of hot air or gases may occur in areas on fire, as well as toxic effects or asphyxiation from smoke and fumes. Flash burns, which are typical of nuclear explosions, are generated within a fraction of a second, whereas flame burns develop more slowly. The damage to tissue is not quite the same, as internal organs are more affected by the slower heating in flame burns.

Moderate burns over 20 per cent of the body, or severe burns over 10 per cent, are considered to be grave even under circumstances favourable to treatment and healing. If no treatment at all is available, mortality from burn injuries will be very high. For instance, a 40 per cent burn might be fatal in one case out of five if medical treatment is optimal, but fatal in all cases if treatment is delayed for 24 hours.

2. Radiation Injuries

The most specific medical effects related to a nuclear explosion are the radiation injuries. Ionizing radiation from such explosions would always inflict some damage to biological tissue. Therefore, humans, animals and plants would be affected. Generally speaking, the larger the radiation dose, the more severe the resulting radiation injury to the organism. The injury to the individual caused by any given dose, would vary, however, depending on the species, age and general condition of the irradiated individual, the composition of the dose and the rate of irradiation. Human radiation injuries can be of different types: acute radiation sickness, long-term effects that comprise an increased probability of late cancer and genetic effects, and short-term effects such as injuries in the prenatal stage and decreased immunological resistance.

A nuclear explosion would cause radiation injuries in several ways. Almost all of the initial radiation dose would be received from high-intensity radiation released within seconds in the immediate vicinity of the burst. This would be followed by the radiation from fall-out. The fall-out radiation emanates from particles outside the body, emitting harmful beta and gamma rays (external radiation). Large doses associated with early fall-out will be followed by lower intensity radiation received over a long period of time—from hours up to days, if it is possible to leave the area, otherwise much longer. There is some difference in biological response, however: a slowly accumulated dose is generally considered less harmful than an equally large instantaneous dose, owing to recovery mechanisms. On the other hand, recovery mechanisms are overwhelmed in many cases of repeated exposure.

In addition to the external radiation, living tissue may be injured by radiation from radioactive substances in the fall-out that have entered the organism by breathing, eating and drinking. The radiation doses received from such internal sources are likely to be much smaller than early external doses from fall-out. On the other hand, internal doses might accumulate for long times in specific organs and may thus contribute significantly to late radiation injuries, in particular, cancers.

Some types of cells are more radio-sensitive than others, and consequently certain organs or functions are disturbed at lower dose levels than others. The stem cells in the bone marrow, which produce various types of blood cells, are highly radio-sensitive. Hence, the so-called bone-marrow syndrome, characterised by low levels of certain blood cells, including lymphocytes, dominates the radiation response of the human body at moderate dose levels. Before this syndrome appears, however, there are other, unspecific symptoms called "prodromal". The term "acute radiation sickness" covers the prodromal stage, the bone-marrow syndrome and the gastro-intestinal and neurovascular syndromes appearing at higher doses.

For the reasons described above, an important form of treatment of radiation injuries would be to prevent or reverse infections by providing the patients with the cleanest possible environment, preferably in isolated wards, and by using antibiotics, antimycotics and blood transfusions. Resources of these kinds will most likely be scarce or unavailable in the aftermath of a nuclear war.

Those who survive an acute radiation injury stand a larger risk than others of contracting certain diseases, in particular various forms of cancer. These afflictions are called late radiation injuries, as they may remain latent for years or decades before manifesting themselves. Even if the radiation exposure was not large enough to cause a state of acute sickness, it would produce an increased risk of late cancer. Radiologists now estimate the cancer risk per unit dose to be about five times higher than previously thought. This means that 5 to 10 cases per man-gray are expected instead of 1 to 2 cases.

When the exposure is an essentially uniform, whole-body irradiation from an external source, the total risk mentioned above is the sum of specific risks for different types of cancer, among which leukaemia, lung cancer and possibly stomach cancer are the most common. Exposure to radiation from internal sources will add to the overall dose received by a particular organ. Certain radio-nuclides accumulate in some organs.

Radiation at much lower dose levels seems to be harmful to the human foetus, especially during the first four months or so of gestation. An exposure in utero can give rise to malformations, mental retardation and increased susceptibility to serious diseases, including childhood cancers, in addition to an increased risk of pre-natal or neo-natal death.

Furthermore, it is known that radiation affects the gonads (ovaries and testicles) and that radiation-induced mutations may then appear in the reproductiv cells. It has been suggested that the changes may be transmitted to live offspring, thereby constituting a genetic damage that could become manifest in that or future generations. However, it is very difficult to assess the precise relationships between radiation doses and genetic damage in humans. The data available is insufficient to demonstrate genetic damage among the offspring of Hiroshima and Nagasaki survivors, for instance.

The 1980 United Nations study assumed in a "worst case scenario" that the source of radiation would be global fall-out from 10,000 Mt total explosive yield. It quotes one consequence of this to be between 5 and 10 million excess totalities from cancer over a period of about 40 years. The recent scientific findings, as adopted by UNSCEAR, would indicate corresponding numbers of 25-50 million, with an additional number of non-lethal tumours (including thyroid cancer) totalling perhaps 10 million. The cases of hereditary ill health caused by radiation may number a million or so in the first two generations and several million over the indefinite future.

3. Other Health Effects

There are other long-term factors that must be taken into account. The need for medical care would obviously be most acute during the first hours or days following a nuclear exchange. For instance, one nuclear explosion could produce tens of thousands of burn victims. In view of the fact that the United States has facilities to treat about 2,000 serious cases of burns and Western Europe about 1,500, it is clear that even peacetime resources would be quite inadequate to manage the casualties. Moreover, peacetime resources will not be available, as the qualified medical services either would be destroyed by the nuclear explosions or, if they are intact, may be too remote from the scene to be efficiently used.

Furthermore, it is likely that production of medical supplies would be severely disturbed if major cities were attacked. Shortages of antibiotics or vaccines, for instance, would affect the whole world. The same would most likely hold true for other products, such as pesticides and detergents, which are needed to maintain hygienic standards and to fight different vectors of epidemic diseases. The severe food shortages and starvation that would be likely to occur in the aftermath of a major nuclear war would add considerably to the detrimental effects on global health.

E. Environmental and Other Global Effects

It has long been recognised in principle that certain consequences of a major nuclear exchange would not be possible to limit to the territories of nuclear weapon States, or the territories of other nations being included in the nuclear exchange. This fact has become more widely accepted during the last few years, concomitant with new findings that add further dimensions to the projections of the global aftermath of such an exchange.

1. Climatic Effects

The question of climatic perturbations has been thoroughly studied in the last decade. The analyses done up to 1980 had focused largely on the possible changes in the climate due to the injection of dust into the atmosphere caused by nuclear explosions. The new analyses first carried out in 1982 took into account in their calculations an additional element, i.e. the effects of widespread fires that would be ignited by the nuclear explosions. The new estimates of the cooling effects, brought about by the absorption of sunlight in the clouds of smoke, were considered so dramatic that the term "nuclear winter" was coined to describe them.

During the following years, a substantial amount of additional research was carried out to explore more thoroughly the possible atmospheric changes induced by different forms of nuclear warfare, as well as the biological consequences of such changes. The most comprehensive study carried out so far is that made by the Scientific Committee on Problems of the Environment (SCOPE), a committee organised by the International Council of Scientific Unions. The results of this end other studies were summarised in a recently published United Nations study, the most relevant parts of which read as follows:

> "The scientific evidence is now conclusive that a major nuclear war would entail the high risk of a global environmental disruption. The risk would be greatest if large cities and industrial centres in the northern hemisphere were to be targeted in the summer months. During the first month, solar energy reaching the surface in mid-latitudes of the northern hemisphere could be reduced by 80 per cent or more. This would result in a decrease of continental averaged temperatures in mid-latitudes of between 5° to 20° C below normal within two weeks after the injection of smoke during summer months. In central continental areas individual temperature decreases could be substantially greater.... Recent work... suggests that these effects might be compounded by a decrease in rainfall of as much as 80 per cent over land in temperate and tropical latitudes. The evidence assessed to date is persuasive that residual scientific uncertainties are unlikely to invalidate these general conclusions.
>
> "Beyond one month, agricultural production and the survival of natural ecosystems would be threatened by a considerable reduction in sunlight,

> temperature depressions of several degrees below normal and suppression of precipitation and summer monsoons. In addition, these effects would be aggravated by chemical pollutants, an increase in ultraviolet radiation associated with depletion of ozone and the likely persistence of radioactive 'hotspots.'
>
> "The sensitivity of agricultural systems and natural ecosystems to variations in temperature, precipitation and light leads to the conclusion that the widespread impact of a nuclear exchange on climate would constitute a severe threat to world food production."

The residual scientific uncertainties mentioned above pertain to virtually all steps in the physical processes involved. Some examples of these uncertainties are the amount and characteristics of combustible materials that will burn after a specified explosion, the amounts of smoke and soot produced by the combustion, the optical and other properties of the smoke particles and the altitude to which the smoke rises. In addition, mathematical models used to simulate dynamic processes in the atmosphere must always be simplifications. However, much of the original uncertainty has been resolved through experimental research since 1983. Concurrently, more sophisticated models for numerical analysis of atmospheric processes have been employed. It should be recalled, however, that the basic uncertainties associated with the war scenarios, such as choice of weapon yields, targets, and so on cannot be resolved by science.

2. Ozone Layer Effects

In addition to global climatic effects, the use of nuclear weapons is expected to affect the ozone layer as well. The fireball from a nuclear explosion heats the air to temperatures where oxygen and nitrogen molecules dissociate. In the subsequent cooling, a number of different nitrogen oxides are formed. It is estimated that a 1 Mt explosion would produce 5,000 tons of such oxides. In a large nuclear exchange the quantities of nitrogen oxides injected into the upper atmosphere would be considerably higher. These oxides would then reach the ozone layer in the stratosphere and might, through chemical reactions, partially destroy it in a few months.

The extent to which the release of a given quantity of nitrogen oxides would deplete the ozone layer is not entirely clear. It is believed, however, that some 50 per cent of the ozone column might be depleted in a major nuclear exchange taking place during the summer months. In winter conditions the percentage would be smaller (some calculate 10-20 per cent).

Irrespective of the percentage of ozone layer depletion, the depletion would produce a number of harmful effects. For instance, since ozone is an effective barrier to solar ultraviolet radiation, its depletion would result in an increase of this radiation at the surface of the Earth. Although the full biological implications of increased ultraviolet radiation to ecosystems at various latitudes are not known, skin cancer is related to large amounts of ultraviolet radiation. Plants and animals might also be affected. Ocean phytoplankton, the basis of the world food chain, has been shown to be particularly sensitive.

3. Other Effects

Other world-wide effects of a major nuclear exchange are difficult to examine and assess. However, the fact that today's world is characterised by a large, intricate and increasing international interdependence in all aspects of life strongly suggests that significant global economic and social disruptions would be an unavoidable consequence of such an exchange.

In the first place, all countries in the world, combatants as well as non-combatants, would suffer a drastic reduction of foreign trade. This would be due to factors such as a decrease in production volume both of essential commodities and raw materials, disruption of services and breakdown of the organisation of world commerce and communications. The world food supply and production would also be imperilled by trade disruptions. It is also expected that climatic perturbations would have some impact on agriculture in any major war scenario.

The 1980 United Nations study on nuclear weapons gave an indication of the possible global food situation after a nuclear exchange, without considering additional climatic problems. The 1985 study by the Scientific Committee on Problems of the Environment, however, provided more analysis of the vulnerability to losses of agricultural productivity and the potential for recovery of food production as well as various assumptions regarding the climatic disturbances. A simplified assessment was made for some 120 other countries. The results were, in brief, that very few countries had a capability to support their populations either in the short term, by using stored food, or in the longer term, by resuming or maintaining agriculture at the levels permitted by drastically reduced trade and by an altered climate. Between several hundred and about two thousand million people globally would be at risk of serious food shortages following a large nuclear exchange. The actual numbers of starving people, as well as the duration of the famines, depend on scenario assumptions. It is important to note, however, that famines, with possible mass death due to starvation, are likely to occur in non-combatant countries as well as in combatant ones, and even in countries remote from the theatres of war. The most vulnerable countries are developing nations in Africa, Asia and South America.

These conclusions of the SCOPE study are in general agreement with the findings of other independent studies, as well as with those of the 1980 United Nations study. They all note that eventually the victims of the indirect, large-scale and long-term effects of a major nuclear war would far outnumber the victims of the immediate effects of the nuclear explosions:

F. Possible Protective Measures

A number of nations, especially in Europe, have organised a civil defence to meet the demands of a conventional war, with or without additional features specifically designed for nuclear war situations. Basically, all measures aim at short-term needs.

Some of these measures could help to limit the number of immediate fatalities caused by a nuclear attack. In view of the large devastation that would be caused, however, especially if nuclear weapons were used directly against the population, available resources for post-attack relief could prove totally inadequate. The value of protective measures in the case of a major nuclear exchange is a matter of dispute. There are those, however, who contend that a war might turn out to be limited in some sense and that it would be reasonable to undertake such protective measures as are technically and economically feasible.

Civil defence could, for instance, be very effective in saving lives that would otherwise be lost to fall-out in a limited attack against hard targets. On the other hand, it would be far less effective in a war involving strikes against industry in cities, or against the civilian population as such. This holds true for non-nuclear weapon States as well as nuclear weapon States in a nuclear war. Even in countries that do not themselves come under a nuclear attack, civil defence would be needed to deal with fall-out from large numbers of nuclear explosions in neighbouring countries.

After a nuclear attack and to some extent after fall-out contamination originating from an attack elsewhere, there would be a need for food, energy, medical supplies, clothing and provisional housing. Crisis stockpiling of basic supplies would be an important precaution for dealing with these difficulties during the first days or weeks. However, allocation and distribution of emergency supplies would have to be carefully planned.

In discussing the question of civil defence, some analysts have endeavoured to compare the Chernobyl nuclear reactor accident of 1986 with the possible aftermath of a nuclear war. Although the circumstances would be different because Chernobyl involved only a release of radiation, with no associated blast damage, they believe this experience points to the kind of difficulties that would ensue after a nuclear exchange. For example, at Chernobyl the civil defence efforts were inadequate to deal with the situation. In a nuclear war, the magnitude of the problems related to civil defence would be greatly increased.

OVERVIEW, FINDINGS AND CONCLUSIONS OF THE UNITED NATIONS STUDY EVOLUTION OF A NEW DIMENSION OF CONCERN

A nuclear war would be totally unlike any previous form of warfare in its immeasurably greater destructive power. Atom bombs of the type used at Hiroshima and Nagasaki represented an increase in explosive power from the equivalent of tons of trinitrotoluene (TNT) to thousands of tons (kilotons). Hydrogen bombs, developed about a decade later, represented an increase from thousands of tons to as much as millions of tons (megatons). Over 50,000 nuclear weapons now exist throughout the world, amounting to an estimated total yield of some 15,000 megatons (about 5,000 times greater than that of all the explosives used in the Second World War).

The publication of "The Atmosphere After a Nuclear War: Twilight at Noon" by Crutzen and Birks (1982) marked a turning point in the consideration of the indirect effects of a large-scale nuclear war. They realised that large quantities of light-absorbing smoke particles would be injected into the atmosphere by fires ignited by nuclear explosions. The incoming sunlight, which warms the Earth's surface and provides the energy that drives the atmospheric processes and biological production, would be reduced by the smoke and soot, altering the weather and influencing climate. Further calculations on the amounts of combustible material, smoke emission and radiative properties of the smoke supported the hypothesis. Significant potential effects on natural ecosystems, fisheries and agriculture were recognised.

Agricultural supplies for the survivors of the direct effects would be jeopardised.

The basic climatic effects of massive smoke injections were further explored in a paper by R. Turco, O. Toon, T. Ackerman, J. Pollack and C. Sagan (1983), known by their initials as the TTAPS group. Using scenarios for smoke and dust production and properties, and modified climate models, TTAPS predicted adverse effects, including coolings of up to 25° to 30° C over the land mass of the northern hemisphere, strong heating and stabilisation of the upper troposphere, and accelerated transport of smoke to the southern hemisphere. The darkness, land cooling and radiological effects were potentially so severe that the term "nuclear winter" was coined as a metaphor for the aftermath of a nuclear war involving thousands of megatons of explosives (a sizeable fraction of the existing nuclear arsenals). The TTAPS group did not predict permanent or long-term perturbations, but because of the implied global-scale devastation, the TTAPS authors expressed the hope that "the issues raised here will be vigorously and critically examined". The TTAPS article was accompanied by a paper in which a number of biologists considered the possible widespread impact on natural ecosystems and on agriculture.

Examination of the effects on the atmosphere and biosphere was made at a Conference on the Long-term World-wide Biological Consequences of Nuclear War in Washington, D.C., on 31 October and 1 November 1983. The meeting was organised by astronomer Carl Sagan and biologist Paul Ehrlich, with an advisory committee of physical and biological scientists. Soviet work reflecting similar findings was also presented and a teleconference between Washington and Moscow via satellite linkage provided an opportunity for United States and Soviet scientists to exchange views. Participants were informed of the environmental stresses that might result from a nuclear exchange, including substantial surface coolings and intense radioactive fall-out, as well as the direct destruction of societal infrastructure. The Conference also heard discussions of large uncertainties in the new predictions and the need for further research into this important problem.

In early 1983, the United States Department of Defense commissioned a major study by the National Research Council of the United States National Academy of Sciences. After stressing limitations imposed by uncertainties, the report concluded as follows:

> "...The committee finds that, unless one or more of the effects lie near the less severe end of their uncertainty ranges, or unless some mitigating

effect has been overlooked, there is a clear possibility that great portions of the land areas of the northern temperate zone (and, perhaps, a larger segment of the planet) could be severely affected. Possible impacts include major temperature reductions (particularly for an exchange that occurs in the summer) lasting for weeks, with subnormal temperatures persisting for months. The impact of these temperature reductions and associated meteorological changes on the surviving population, and on the biosphere that supports the survivors, could be severe, and deserves careful independent study."

The USSR Academy of Sciences also examined the physical, chemical and biological consequences of a nuclear war involving 5,400 megatons of total explosive yield and stated that "the main conclusion from our study is that even the most 'optimistic' scenarios of the consequences of the nuclear conflict (if it is fair to speak of optimism in this case) would inevitably result in a global ecological and demographic crisis. Generally similar conclusions were made in reports by the Royal Society of Canada (1985) and the New Zealand Planning Council (1987), which addressed the implications for Canada and New Zealand respectively.

In 1983, the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) was commissioned to mount a study into the environmental consequences of nuclear war, entitled SCOPE-ENUWAR. Over 300 scientists from 30 countries participated in the preparation of a 2-volume 882-page report published in 1986, which remains the definitive study. The analysis included an extended study of biological effects, while confirming their overall conclusions on the physical effects. In sum, the report concluded that "... the indirect effects on populations of a large-scale nuclear war, particularly the climatic effects caused by smoke, could be potentially more consequential globally than the direct effects, and *the risks of unprecedented consequences are great for non-combatant and combatant countries alike* " (emphasis in original).

Subsequent research employing more realistic three-dimensional models has suggested that temperature decreases would be less than first envisioned. However, these could still be large enough to cause serious global effects on natural and agricultural ecosystems over time spans of months to years.

The hypothesis was reviewed in 1986 (Golitsyn and Phillips) and 1987 (Golitsyn and MacCracken) by the Joint Scientific Committee that oversees the World Climate Research Programme of ICSU and the World Meteorological Organisation (WMO), which has twice concluded that the prediction of serious temperature changes in the weeks following the generation of 100 to 200 million tonnes of smoke from fires after a nuclear exchange *"would not be modified (except in detail) no matter how much success attended major efforts to refine the many uncertainties in the atmospheric calculations".*

The SCOPE-ENUWAR project convened workshops at Bangkok, in February 1987, at Geneva, in November 1987, and in Moscow, in March 1988, to consider more recent results. These supported earlier SCOPE-ENUWAR assessments of the impact of nuclear war on the climate. New phases of research were initiated at these workshops, namely, case-studies of the impact of nuclear war on the agricultural systems of specific countries, a more detailed analysis of the sources and behaviour of smoke in the atmosphere and more detailed studies of ionizing radiation in the light of the Chernobyl experience.

The effects of nuclear war on health and health services have been studied since 1982 by the World Health Organisation (WHO), with the publication of two reports (1984, 1987). The World Health Assembly has recommended that the Organisation, in co-operation with other United Nations agencies, continue the work of collecting, analysing ' and regularly publishing accounts of activities and further studies on the effects of nuclear war on health and health services, the Health Assembly being kept periodically informed.

Progress on Key Scientific Issues

Earlier estimates of the amount of combustible material (fuel loading) have been refined by successive analyses of production and inventory, for example, the detailed survey of a representative set of targets in the United States. While global estimates of up to 150 million tonnes of smoke that could be released into the atmosphere remain generally credible, recent work has indicated that these amounts are in the upper range. On the other hand, estimates of the components of smoke emissions produced by burning materials such as petroleum and plastics in large fires have increased substantially. Moreover, as a result of recent measurements in laboratory work and in small-scale fires, estimates of the ability of smoke produced in urban fires to absorb sunlight have increased by as much as three times over some earlier calculations. This dark, sooty component of smoke emissions is now recognised as the most important factor with regard to effects on the atmosphere and climate, and accordingly much of the recent research has focused on the characteristics of soot particulates.

This large amount of smoke and soot would absorb a substantial fraction of incoming solar radiation over much of the northern hemisphere. Estimates of the reduction of insolation vary considerably, depending on the scenario: in instances of concentrated smoke, the available light at the surface might be only 1 per cent of normal for periods of a few days, and less than 20 per cent of normal for a few weeks or more.

Smoke injected by large fires can initially reach altitudes of as much as 15 kilometres, although most will be in the 5 to 10 kilometre range. The rising smoke eventually stabilizes, allowing the smoke to spread laterally at the stabilisation height. Subsequent heating of the smoke by absorption of solar radiation can result in the further ascent of the smoke particles. Recent modelling studies indicate that such large-scale "lofting" from mid-altitudes during the northern hemisphere summer may carry a large fraction of the smoke as high as 30 kilometres. The self-induced lofting of nuclear war smoke suggests that its residence time in the stratosphere could be greatly increased, that substantial quantities of smoke could be transported to the southern hemisphere and that the integrity of the stratospheric ozone layer could be threatened.

The removal efficiency of smoke by clouds and precipitation (referred to as "scavenging" and "removal") is presently assumed to be in the range of 30 to 50 per cent during the first few days following smoke generation, although uncertainties are large and the actual amounts could be more or less. The removal processes include the "prompt" scavenging in "black rain" directly over the conflagrations expected after a nuclear exchange, as well as subsequent scavenging by precipitation downwind of the fires. Scavenging of the smoke would decrease the potential for light reductions and patchiness would produce lighter and darker regions locally. Recent laboratory and field measurements of smoke properties suggest that the removal efficiency for the the blackest, sootiest smoke may be smaller than is currently assumed. Accordingly, further refinement of the smoke (soot) scavenging estimates is needed.

New laboratory studies indicate that soot reaching the stratosphere (by direct injection and self-lofting) is not likely to be rapidly decomposed by reacting with ozone and that this process may take about a year or more. This important result implies that soot clouds could be quite stable in the upper atmosphere, allowing them to spread globally, with the potential for long-term effects on the global climate.

Although still highly simplified, significant advances have been made in modelling the atmospheric response to massive smoke injections. The laws governing relevant atmospheric processes are cast in mathematical form and the resulting equations solved on high-speed computers. Such computations using advanced general circulation models are now capable of representing, in detail, the changes in solar and thermal infra-red radiation transfer, the hydrologic cycle, as well as atmospheric circulation and dynamics. Such models, adapted for simulation of "nuclear winter" conditions, have been developed at the Los Alamos National Laboratory, the National Center for Atmospheric Research and the Lawrence Livermore National Laboratory in the United States, the Computing Centre of the USSR Academy of Sciences in the Soviet Union, the United Kingdom Meteorological Office and the Commonwealth Scientific Industrial Research Organisation in Australia. Work on these models has led to significant general advances in climate modelling capabilities. These models confirm the possibility that sub-freezing temperatures may be reached in localised regions even in summer. They also show substantial reductions of precipitation and suppression of the summer monsoon, even with relatively small amounts of smoke. Moreover, the potential for climatic effects lasting for a period of one year or more have been recognised, with the possibility of average global temperatures decreasing by several degrees, which could have a major effect on agriculture.

There is now ample observational evidence that the smoke from natural forest fires and dust, if present in sufficient quantities, can cause decreases of several degrees in daytime temperatures in a matter of hours to days. These reductions are reproduced well by the models, which means that the basic physical processes are sufficiently understood. This also increases confidence in the model results showing more severe temperature reductions if very large quantities of smoke were injected into the atmosphere by fires started after a nuclear exchange.

The injection into the stratosphere of the nitrogen oxides produced in a nuclear fireball and air from the lower atmosphere, which is low in ozone, the displacement of the ozone-rich lower stratospheric air and the dependence of chemical reaction rates on the anticipated temperature increase of the stratosphere are also being studied with respect to their potential for reducing the amount of stratospheric ozone. Ozone depletion would imply increased damaging ultraviolet solar radiation for several years following a nuclear exchange. Current estimates are that ozone reduction could be very substantial, of the order of 50 per cent. Because of the great potential importance of this problem, it urgently needs further study.

The electromagnetic pulse caused by high-altitude nuclear detonations can disrupt and damage a wide variety of electrical and electronic components and devices, leading to the loss of power, communications and other services out to distances of thousands of kilometres. This would represent a significant additional disruption to the infrastructure on which survivors would have to rely.

Early radiation, along with blast and heat, would kill many people in the immediate vicinity and destroy the housing, sanitation, transport and medical facilities. Beyond the area of devastation, nuclear fall-out arising from the explosions themselves and from the destruction of nuclear installations would spread globally and be a source of continuous radiation exposure for years. The long-term consequences (e.g. cancers, malformations and possibly genetic effects) among the survivors of the initial radiation burst and those exposed to fall-out would be significant, but their importance would be considerably smaller than consequences from the early effects and those resulting from disruption of basic infrastructure, including medical and food distribution services, for months and perhaps years after the event.

Findings and Conclusions

The Group's examination of the evolution of scientific thought on the global environmental consequences of a nuclear war reveals a clear convergence towards consensus. The criticisms and objections that have been raised from time to time—mostly concerned with uncertainty and limitations of early models—have been reviewed by this and other expert groups (e.g. the Joint Scientific Committee) and do not invalidate the conclusion that a large-scale nuclear war could have a significant effect on global climate.

The scientific evidence is now conclusive that a major nuclear war would entail the high risk of a global environmental disruption. The risk would be greatest if large cities and industrial centres in the northern hemisphere were to be targeted in the summer months. During the first month, solar energy reaching the surface in mid-latitudes of the northern hemisphere could be reduced by 80 per cent or more. This would result in a decrease of continental averaged temperatures in mid-latitudes of between 5 ° and 20° C below normal within two weeks after the injection of smoke during summer months. In central continental areas individual temperature decreases could be substantially greater.

Three-dimensional atmospheric circulation models with detailed representations of physical processes indicate regional episodes of sub-freezing temperatures, even in summer. These temperature decreases are somewhat less than those suggested by earlier less complex atmospheric models, but the agricultural and ecological effects are no less devastating. Recent work presented at the SCOPE-ENUWAR workshop in Moscow in 1988 suggests that these effects might be compounded by a decrease in rainfall of as much as 80 per cent over land in temperate and tropical latitudes. The evidence assessed to date is persuasive that residual scientific uncertainties are unlikely to invalidate these general conclusions.

Beyond one month, agricultural production and the survival of natural ecosystems would be threatened by a considerable reduction in sunlight, temperature depressions of several degrees below normal and suppression of precipitation and summer monsoons. In addition, these effects would be aggravated by chemical pollutants, an increase in ultraviolet radiation associated with depletion of ozone and the likely persistence of radioactive “hotspots”.

The sensitivity of agricultural systems and natural ecosystems to variations in temperature, precipitation and light leads to the conclusion that the widespread impact of a nuclear exchange on climate would constitute a severe threat to world food production. The prospect of widespread starvation as a consequence of a nuclear war would confront both targeted and non-targeted nations. This would be aggravated by the increasing dependence of food production on inputs of energy and fertilizers and the dependence of food distribution and availability on a smoothly functioning societal system of communications, transportation, trade and commerce. The human impact would be exacerbated by an almost complete breakdown of health care in targeted countries and the likelihood of an increase in damaging ultraviolet radiation. The direct effects of a major nuclear exchange could kill hundreds of millions: the indirect effects could kill billions.

The socio-economic consequences in a world intimately interconnected economically, socially and environmentally would be grave. The functions of production, distribution and consumption in existing socio-economic systems would be completely disrupted. The severe physical damage from blast, fire and radiation in the targeted countries would preclude the type of support that made recovery possible following the Second World War. The breakdown of life support systems, communications, transportation, the world financial and other systems would compound the difficulties caused by food shortages in non-targeted countries. Long-term recovery would be uncertain.

The immediate and direct effects of nuclear explosions and the global, environmental consequences of a major nuclear war constitute a continuum. Each would exacerbate the other. Moreover, there would be synergy within each aspect as well as between them so that the integrated total effect of fire, blast and radioactivity would be greater than their sum. Similarly, temperature decrease, brief sub-freezing episodes, diminished precipitation, suppressed monsoons and increased ultraviolet radiation would interact in a manner that would compound their separate effects. The global, environmental disruption resulting from a major nuclear war would be inseparably related to its direct and localised effects. Both should be considered in resolving policy issues of nuclear weaponry and should be the concern of all nations.

The possibility exists that further global environmental consequences of a major nuclear exchange may yet be identified. The Group believes that the co-operative, international scientific effort that has identified this new dimension of nuclear warfare should be continued to refine present findings and to explore new possibilities. For example, there is a need to resolve the emerging issue of a possibly massive depletion of ozone as a result of major nuclear war and the ensuing increase in ultraviolet radiation with potentially serious consequences for exposed living organisms.

The scientific advances that have led to a clearer understanding of the global consequences of major nuclear war should be pursued internationally. They should also interact strongly with the analysis of public policy decisions on these issues, which have potential implications for non-combatant nations as well as for nations that might be in conflict. The discussion of these matters has underscored the importance of the dialogue between the world scientific community and public policy makers—a dialogue that has illuminated this general issue during the 1980s.

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NUCLEAR WEAPONS AND INTERNATIONAL SECURITY

A. Nuclear Weapons and Security Concepts

The Charter of the United Nations, which took effect in the aftermath of the Second World War, has laid down a broad foundation for world peace and order in the post-war era and has envisaged mechanisms for its preservation. It declared as one of the organisation's purposes to maintain international peace and security and to that end to take effective collective measures for the prevention and removal of threats to peace. It also recognised the inherent right of States to individual or collective self-defence in case of an armed attack and noted that nothing in the Charter precluded the existence of regional arrangements for the maintenance of international peace and security as appropriate for regional action. This has enabled States in meeting their security concerns to place emphasis on those options envisaged in the Charter which best suited their perceived national requirements.

The emergence of nuclear weapons has, however, added another dimension in the consideration of the question of individual, regional and global security of States, resulting in a long-lasting debate on the subject matter. This debate reflects differences in attitude on the role of nuclear weapons in general, and their relevance for national and international security in particular.

An overwhelming majority of non-nuclear weapon States have formally renounced the possibility of acquiring or possessing nuclear weapons by adhering to the 1968 Treaty on the Non-Proliferation of Nuclear Weapons or to the two existing treaties establishing regional nuclear weapon free zones, or to both of the above.

While not possessing nuclear weapons themselves, some of the non-nuclear weapon States, through various arrangements, including regional military alliances, have associated themselves with respective nuclear weapon States, thereby accepting the so-called "nuclear umbrella" as an element of their defence, and consider that in their circumstances nuclear deterrence is a means to prevent war, including nuclear war. Other non-nuclear weapon States have excluded this option from their national security considerations and have taken the position that nuclear weapons would threaten the very survival of the human race if these weapons were ever used in a major conflict. Thus, different approaches to security have been pursued by different individual countries or groups of countries.

The United States and the Soviet Union have, in the process of seeking to strengthen their national security, built large stocks of nuclear weapons. Although China, France and the United Kingdom have relatively small numbers of these weapons, they also see nuclear weapons as making a fundamental contribution to their national security.

Other non-nuclear weapon States question whether nuclear weapons contribute in a positive way to security and contend that their own security is threatened by the possibility of nuclear war, which, in their opinion, cannot be excluded as long as these weapons exist. In view of this these States hold that international peace and security cannot be fully guaranteed until the ultimate elimination of all nuclear weapons is attained. On their initiative, the General Assembly held its first special session devoted to disarmament in 1978, and adopted a Final Document that called upon all States, in particular the nuclear weapon States, *inter alia*., to consider as soon as possible various proposals designed to secure the cessation of the nuclear arms race, the avoidance of the use of nuclear weapons and the prevention of nuclear war and thereby ensure that the survival of mankind is not endangered.

Many proponents of the latter approach have renounced possession of nuclear weapons and pursue a policy of non-alignment or neutrality. In that context, they advocate alternative methods for strengthening international peace and security.

One of these methods is reflected in the concept of nuclear weapon free zones. The general objective of such arrangements would be to prevent the emergence of new nuclear weapon States in the region concerned and to assure against nuclear attack on the countries comprising the zone, as well as to ensure generally the absence of nuclear weapons from the region, including their stationing. Many States believe that such zones offer the prospect of precluding nuclear weapons altogether from the considerations of the security of a region.

It would be important to assure that there is no possibility of clandestine production or acquisition of nuclear weapons in such zones. Examples of successful regional agreements are the zones established in Latin America by the 1967 Treaty of Tlatelolco and in the South Pacific by the 1987 Treaty of Rarotonga.

A number of countries have advocated even broader approaches to regional security than nuclear weapon free zones. These are the-concepts of "demilitarised zones" and "zones of peace". The 1959 Antarctic Treaty is the foremost example in the first case in the second, discussions are taking place on the creation of zones of peace in the Indian Ocean, the Mediterranean and the South Atlantic.

In the 1980s, yet another approach to international security in the nuclear era emerged—the concept of common security. According to the concept, the key to security lies in the willingness of nations to organise their security policies in co-operation with each other. The proponents of this concept felt that this process of co-operation should begin with the improvement of relations between the two major powers, the United States and the Soviet Union, and the respective military alliances they belong to. They further suggested that the *rapprochement* and normalisation of relations between them should be combined with negotiations for conventional and nuclear arms limitation agreements, which are now taking place. In this process, in their opinion, close attention should also be paid to the problem of underdevelopment, which might have wider repercussions by causing wars and thereby destabilising international peace and security. This sentiment was amplified further by the States that participated in the 1987 International Conference on the Relationship between Disarmament and Development. The Final Document of that Conference noted that non-military threats to national security of States had moved to the forefront of global concern for international security.

When discussing the question of international peace and security in the nuclear age, it is important to recall that the quantitative and qualitative growth of nuclear weapons has been chiefly a consequence of the long-standing tensions and distrust between East and West. The end of the decade of the 1980s has, however, seen a positive change in this relationship. The world is no longer bipolar but is rather moving in the direction of new multipolar political and economic relationships that could have a profound effect on international security. This trend is further reinforced by recent important progress and concrete results in the bilateral negotiations on nuclear weapons between the United

States and the Soviet Union and in the negotiation on conventional weapons between NATO and the Warsaw Treaty Organisation. Thus, there is a growing recognition that negotiated reductions to progressively lower levels of nuclear weapons are desirable and possible and that they have the most positive impact on international peace and the security of all.

B. International, Security and Quantitative and Qualitative Development of Nuclear Weapons

The discussions of international security in the nuclear era have, generally speaking, focused on four specific aspects of the issue: (a) quantitative and qualitative developments of nuclear weapons by the nuclear weapon States; (b) possible acquisition of nuclear weapons by additional States; (c) geographical spread of the deployment of nuclear weapons; and (d) the prevention of accidental use of nuclear weapons.

As far as the nuclear weapon States are concerned, a central issue in these debates has been the question of quantitative and qualitative developments of their stockpiles. The two major powers have long acquired the potential of inflicting unacceptable levels of destruction on each other. Their main concern since has been whether one side might acquire the potential to deny the other side the capability for a disarming first-strike. This concern has been responsible in large measure for the fuelling of the nuclear arms competition.

As an illustration of this phenomenon, it is pointed out that, according to academic sources, in 1967 the United States possessed some 4,500 strategic warheads while the Soviet Union had approximately 1,000. However, it is estimated that by 1990 these stockpiles may have increased up to 13,000 for the United States and 11,500 for the Soviet Union. This growth involved both quantitative and qualitative aspects.

The number of nuclear delivery vehicles and deployed warheads is expected to drop significantly as a result of the destruction of one whole category of nuclear weapons under the terms of the 1987 Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles (INF Treaty) and the anticipated reductions within the framework of the strategic arms reduction talks (START) expected to be concluded by the end of 1990. At the same time, both major powers are continuing to make technological improvements in the quality of their nuclear weapons.

For example, it is widely believed that the United States Trident-II missile, when deployed, would have about the same accuracy as the majority of currently deployed ICBMs. It is also expected that the Soviet SLBMs will attain comparable accuracy as well. Some analysts believe that both sides will have the capability of achieving a high probability of destruction of any hardened land targets. These developments are related to the perception that, owing to the survivability of SSBNs, their increased accuracy would only enhance nuclear deterrence.

There are those, however, who point out that the shorter flight times and accuracy of the SLBMs may increase fears of a surprise attack. They also note that the increased deployment of strategic cruise missiles, both ALCMs and SLCMs, may represent a further complicating factor because of their accuracy and the unpredictability of their flight patterns.

In addition to developments in technology directly related to weapons advances in other areas also have important implications for national strategic policies of those States which have those weapons. Improvements, for example, in the capability of the command, control and communication systems for the strategic nuclear forces include quicker and more accurate observation by satellites and radars, enabling enhanced warning of attack.

Making an overall assessment of the full implications of all the qualitative improvements is difficult since the various developments appear capable of both contributing to and weakening stability. Thus, for instance, in spite of the technological advances in the weapons industry, a pre-emptive strike against submarine-based missiles at sea or a strategic airforce that maintains a substantive airborne alert would not be effective. As progress is made in the negotiations between the two major powers regarding their nuclear strategic forces, more questions are likely to be asked with regard to the future of the nuclear weapons of the other nuclear weapon States. These three States—China, France and the United Kingdom—although possessing significant nuclear weaponry, still have less than 10 per cent of the total nuclear weapons in the world.

During the 1980s, China, France and the United Kingdom began to modernise and expand their nuclear forces. The United Kingdom plans to buy Trident missiles, which would greatly enhance the accuracy and destructive power of any single British SSBN. France has launched its own maritime and land-based nuclear weapon modernisation programmes. It is estimated that both powers will have the potential to deploy some 500 warheads on their SSBNs. China has also increased its nuclear forces, but not as much as France and the United Kingdom.

The position of the United Kingdom and France is that they could participate in negotiations on their nuclear weapons only if the overall threat to their national security was significantly reduced and, in particular, if the disparity between the nuclear arsenals of the two principal nuclear powers and their respective arsenals was substantially reduced. They believe, furthermore, that negotiations on nuclear weapons could not be conducted without taking into consideration the threat of chemical weapons and conventional armaments.

China holds the view that the two major nuclear powers should take the lead in halting the testing, qualitative development, production and deployment of all types of nuclear weapons and in drastically reducing and eliminating them. After that, a broadly representative international conference on nuclear disarmament, with the participation of all nuclear States, could be held to examine steps and measures for the complete elimination of all nuclear weapons.

C. International Security and Possible Emergence of New Nuclear Weapon States

Apart from the five, no other State in the world has been officially declared to be a nuclear weapon State. In 1974, India detonated a nuclear device. While this explosion demonstrated India's capability to develop nuclear weapons eventually, India declared that it was carried out for peaceful purposes.

As already noted, an overwhelming number of non-nuclear weapon States have also undertaken a formal commitment not to acquire nuclear weapons. Consequently, the discussion of various aspects of international security as related to this group of countries is limited to two basic issues: how to maintain an effective regime for non-proliferation of nuclear weapons without adversely affecting other, peaceful applications of nuclear technology; and how to bring into this regime all those countries which have not yet formally renounced the option of acquiring nuclear weapons, particularly those which are considered to have technical capability to do so or which may have such ambitions.

Under the terms of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), non-nuclear weapon States parties agree to apply safeguards administered by the International Atomic Energy Agency (IAEA) to all their peaceful nuclear activities in order to ensure that fissionable material is not diverted to nuclear explosive purposes. As at February 1990, safeguards agreements were in force for 83 of the 138 non-nuclear weapon States party to the NPT. Of these, 41 States have no nuclear activity and no nuclear material or facility in operation. Fifty-four non-nuclear weapon States party to the NPT have not as yet concluded the required safeguards agreement pursuant to article III.4 of the Treaty. In 1989 the Agency applied safeguards in 42 non-nuclear weapon States party to the NPT and in one State pursuant to the Tlatelolco Treaty.

The Treaties of Tlatelolco and Rarotonga, respectively, also provide for IAEA safeguards. Some 18 of the 23 Latin American States party to the Treaty of Tlatelolco have concluded safeguards agreements with IAEA, as have two States with territories in the zone of application of this Treaty. Safeguards agreements under the NPT have been concluded with 8 of the 11 signatories of the Rarotonga treaty. IAEA also administers the original system of safeguards in accordance with its statute, whereby member States can accept safeguards on nuclear material in specific facilities or on particular quantities of nuclear material.

In recent years, there has been extensive debate about non-proliferation and the basis of nuclear trade in general. Because of the possible connection between peaceful and military nuclear technologies, nuclear facilities and international trade in nuclear materials are subject to a wide range of international controls to provide assurance that nuclear industries are not being used for development of nuclear weapons. States that are major nuclear suppliers have adopted the position that nuclear materials, technology and equipment that could be used for development of nuclear weapons should not be supplied without the recipient State agreeing to apply IAEA safeguards and accept other conditions. Some have adopted stringent national policies designed to seek specific assurances that nuclear co-operation would not lead or contribute to development of a nuclear weapon capability. Other nuclear suppliers also require IAEA safeguards and the commitment by the recipient countries to peaceful uses for their nuclear exports. A number of States now require acceptance of so-called “full-scope” safeguards or adherence to the non-proliferation Treaty or another binding international commitment not to acquire nuclear weapons as a condition for significant nuclear co-operation.

At the end of 1989, already 172 safeguards agreements were in force with 102 States. In 59 States with significant nuclear activities, 924 installations and related facilities were under safeguards or contained safeguarded materials at year-end 1989, including the five nuclear weapon States, where safeguards were actually implemented in 8 nuclear installations.

International consensus exists that, although measures are necessary to prevent the proliferation of nuclear weapons, all States have the right to develop nuclear energy for peaceful purposes. Concern has, however, been expressed by some that the conditions governing access to nuclear technology, equipment, material and services do not sufficiently recognise the fact that national security and development may depend initially on secure access to energy resources. Many States have criticised some policies of supplier States. Their objective in the international discussion of these issues is the search for an agreed basis whereby their desire for fullest access to technology for development is reconciled with the need to insure against the further spread of nuclear weapons.

As regards specifically the question of the acquisition of nuclear weapons by additional States, concerns have been expressed on different occasions and in various contexts, that some non-nuclear weapon States might develop nuclear weapon programmes. This concern was expressed particularly in connection with the so-called "threshold" States. Since many countries, most notably industrially highly developed ones and possibly some others, have both technical capability and resources to become nuclear weapon States, but have not demonstrated any intention in that respect, the term "threshold" usually applies only to those countries which have in various ways demonstrated such intentions or are believed to be pursuing such an objective.

Notwithstanding these concerns, there has been no formal request to put in motion mechanisms envisaged under any of the existing non-proliferation arrangements with a view to clarifying the activities of the countries in question covered by such arrangements. In this connection, it should be noted that neither at the Third Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, in 1985, nor during the preparatory stages for the Fourth Review Conference taking place in August/September 1990 has the question of the possible non-compliance of the parties been formally raised. This is also the case regarding the formal discussions in IAEA, as well as within the framework of the two regional nuclear weapon free zones.

The situation is different regarding the second group of countries, that is, those which are not covered by such arrangements. Several of them are located in areas affected by local tensions and mutual suspicions that have given rise to concerns that some of those countries might, in fact, be interested in or even actively pursuing a nuclear weapon option.

The nuclear programmes of India and Pakistan have been the subject of international concern. Neither country is covered by the existing non-proliferation arrangements, although the Governments of both India and Pakistan have repeatedly reaffirmed their interest in peaceful aspects of nuclear technology only.

Two specific situations have, however, been formally brought to the attention of the United Nations. One concerns Israel and the other South Africa. Neither of these countries is a party to the existing arrangements regarding the non-proliferation of nuclear weapons and both maintain unsafeguarded nuclear installations.

The report on Israeli nuclear armament submitted to the General Assembly in 1987 restated the conclusion of the 1981 Study on Israeli nuclear armament, which noted that, although there was no conclusive proof that Israel possessed nuclear weapons, there was no doubt "that Israel, if it has not already crossed that threshold, has the capability to manufacture nuclear weapons within a very short time". Israel's official position in this respect is neither to confirm nor to deny its nuclear weapon capability. Israel has, on various occasions, formally stated that it would not be the first to introduce nuclear weapons into the Middle East and that it does not co-operate on nuclear matters with South Africa.

The report on South Africa's nuclear capability was submitted to the General Assembly in 1981. Among other conclusions, the report noted that South Africa had the technical capability to manufacture nuclear weapons and that its reactors and enrichment plants had not been placed under IAEA safeguards. Yearly since then, the General Assembly has passed a resolution requesting the Secretary-General to keep at informed regarding new developments in this connection. In August 1988, the Foreign Minister of South Africa declared that his country had the capability to make nuclear weapons. Nevertheless, there is no proof that South Africa has built any weapons yet. South Africa has discussed the possibility of acceding to the Non-Proliferation Treaty with the depositaries on a number of occasions. At its 1990 session, the United Nations Disarmament Commission adopted by consensus a report on South Africa's nuclear capability.

Since the beginning of the 1980s, another concern has been expressed in connection with the activities of the so-called "threshold" countries, namely, the possibility that they might also be developing ballistic missile technology. Such missiles provide the most dependable means of delivering nuclear weapons. The whole matter is further complicated by the fact that the missile technology has also many other military applications not related to nuclear weapon capabilities as well as in the area of peaceful activities. Many States are acquiring this technology through foreign acquisitions or indigenous productions either for military or civilian purposes.

In recent times, a number of States have taken steps on the national as well as on the multilateral level to curb the spread of ballistic missiles. In April 1987, Canada, France, the Federal Republic of Germany, Italy, Japan, the United Kingdom and the United States adopted a regime of parallel export controls designed to counter the proliferation of ballistic missiles or unmanned systems (such as cruise missiles) capable of delivering a 500 kg payload at least 300 km. This regime, entitled the Missile Technology Control Regime (MTCR), also controls export of various missile technologies such as guidance devices, individual rocket stages and re-entry vehicles. Importers of missile technology for approved programmes may be required to provide assurances to signatory nations that such technology will not be used for proscribed programmes. In the last year, Belgium, Luxembourg, Netherlands and Spain have joined and Australia announced its intention to join the MTCR.

In 1988, the Soviet Union and the United States started bilateral discussions on the problems of the proliferation of missile technology, and the United States has discussed the issue with other countries as part of its efforts to strengthen the international nuclear non-proliferation regime. The Soviet Union affirmed its support for the objectives of the MTCR in the Joint Statement issued on 4 June 1990 at the summit meeting between President Bush and President Gorbachev.

D. International Security and Geographical Spread of Nuclear Weapons

The nuclear weapon States maintain their nuclear forces in various deployment areas. Two of them the United States and the Soviet Union— on the basis of bilateral or other arrangements, deploy their forces, including nuclear, at military bases and installations also on the territories of other States. The nuclear weapon States also use the high seas and international air space for their ships and aircraft that carry on board nuclear weapons. Some of these ships and aircraft call on ports of other States and make stops at their airports. Thus, at any given time there are a number of nuclear weapons present in the areas beyond the national territory of the nuclear weapon States themselves. Some aspects of this geographical spread of nuclear weapons have been the subject of continuing discussions and differences in positions.

The majority of non-nuclear weapon States do not permit the deployment of nuclear weapons on their territory. For many of these States, this policy also applies to nuclear weapons on board ships and aircraft on visits to their territory. Many of them also express concern about the use of international waterways and airspace on the grounds that the presence of nuclear weapons there in various ways, such as through accidents, may endanger international security.

In addition, many non-nuclear weapon States do not allow warships carrying nuclear weapons to pass through their internal waters so as not to participate in or assist the spread of nuclear weapons. They also do so in order to preclude the possibility of increasing regional tensions and to avoid the various hazards that may arise, particularly the exposure of their peoples to nuclear contamination at a time when they do not possess the material or technical capabilities to counter such dangers. To allow passage in such circumstances would constitute an evasion of their responsibility towards their peoples.

The position of the nuclear weapon States on the issues raised reflects their different policies regarding the deployment of nuclear weapons. Thus, generally speaking, the nuclear weapon States emphasise their rights under international law to free navigation of the high seas for their naval vessels, including those which may be carrying nuclear weapons, in accordance with the United Nations Convention on the Law of the Sea.

A majority of the nuclear weapon States maintain a policy of neither confirming nor denying (NCND) the presence of nuclear weapons on board their ships and aircraft in any particular place at any particular time. Of the approximately 14,600 nuclear warheads reportedly earmarked for naval and maritime deployment, 9,200 are on ballistic missiles deployed on submarines that would rarely be carried to foreign ports. The remaining 5,400 tactical and strategic weapons are the focus of the NCND issue.

The United States says that the purpose of the policy, *inter alia,* is to “withhold from a potential enemy information that could be used against US forces in the event of a conflict.”

The policies of France and the United Kingdom are similar to that of the United States. To date China has not deployed tactical nuclear weapons on surface vessels.

The Soviet Union offered in 1988, on the basis of reciprocity with the United States and other nuclear powers, to announce the presence or absence of nuclear weapons on board its naval vessels calling at foreign ports.

Currently, the only way to determine whether a ship is actually carrying nuclear weapons is through on-site inspection, although there is a debate about the feasibility of determining the absence of nuclear weapons from a ship by remote sensing as naval ships enjoy sovereign immunity and are exempt under international law from inspections and search by host Governments, States that accept NCND leave the determination of whether to dock to the discretion of the nuclear weapon State.

In recent years, there has been growing public opposition in many countries to visits of ships that may be carrying nuclear weapons. In addition, the policy of neither confirming nor denying makes it difficult to be certain whether or not naval vessels involved in accidents were armed with nuclear weapons.

Also, the difficulty to be certain whether or not naval vessels were armed with nuclear weapons owing to the NCND practice was referred to in resolution 170 (VIII) of the General Conference of the Latin American Organisation for the Proscription of Nuclear Weapons of 19 May 1983 within the context of information concerning the introduction of nuclear weapons during the course of the South Atlantic conflict in 1982.

Certain States have drawn up regulations concerning visits of nuclear-armed or nuclear-powered ships. In 1987, Hew Zealand adopted legislation stipulating that a visit would be granted only "if the Prime Minister is satisfied that the warships will not be carrying any nuclear explosive devices upon their entry into the internal waters of New Zealand". Thus, a nuclear-capable ship can be admitted to New Zealand ports as long as it is not actually carrying nuclear weapons. Although New Zealand does not openly challenge NCND, but rather makes its own assessment of whether nuclear weapons are carried on a particular vessel, France, the United Kingdom and the United States have chosen not to propose warship visits to New Zealand.

In New Zealand's view, prohibiting nuclear weapon-carrying and nuclear-powered ships emanates from its wish not to be defended by nuclear weapons and its belief that nuclear weapons do not have a role in the South Pacific. However, because New Zealand's ship visit policy is based on particular regional security considerations, the New Zealand Government has declared repeatedly that it is not intended as a model for other States to follow.

E. Prevention of Accidental Use of Nuclear Weapons

Since the early days of nuclear weapons, nuclear weapon States have been interested in avoiding any unauthorised or accidental use of nuclear weapons. Many safeguards have been introduced by nuclear weapon States either unilaterally or by agreement. The nuclear warheads themselves have been designed to preclude accidental detonation as a result of exposure to mechanical damage, heat, blast or radiation. Technical designs and procedural rules, have been developed to preserve effective control over nuclear weapons and related operations.

These efforts have been successful in the sense that no accidental or unauthorised nuclear weapon explosion has occurred during the several decades in which up to 60,000 nuclear weapons have been handled. While nuclear weapons have been involved in a number of accidents, none of them has ever exploded.

Although the risks of intentional nuclear war between the two major military alliances are considered to be low and steadily decreasing, it is considered that accidents might initiate a nuclear war unintentionally. In its broadest sense, the term accidental nuclear war would include any way a nuclear war could start in response to false signals, incorrect or misinterpreted information, an unauthorised, accidental or terrorist launch or uncontrolled escalation of a conventional conflict. Technical malfunctioning, human error or irrational decisions under stress could contribute to the risk.

1. Protective Measures

As described in chapter II, the control of nuclear weapons has been highly centralised in all countries concerned. Complex procedures have been developed to secure continuous contact and authentic messages. Special control has been organised by nuclear weapon States for weapons deployed outside their territory. One form of permissive action links (PAL) consists of a highly secure coded signal from the highest political level to be inserted in the weapons before they can be used.

The hotline between Moscow and Washington was established in 1963 after the Cuban missile crisis in order to reduce the risk of nuclear war by accident, miscalculation or failure of communication. It has been improved several times. Similar hotlines have been established between Moscow and London, and Moscow and Paris. Several agreements between the United States and the Soviet Union have been concluded for the purpose of avoiding military confrontation and provocative behaviour and of giving advance notification before missiles are tested.

The positive effect of these measures, however, runs the risk of being counteracted by developments in nuclear weapons systems. As a consequence, further protective measures are needed. The most essential measures must be based on an evaluation of the command and control system.

2. Possible Triggers to an Accidental War

Improvements in satellite-based photo-reconnaissance, ballistic missile guidance, the introduction of multiple warheads on missiles and the development of anti-satellite systems tend to make nuclear weapons and the command and control system vulnerable to attack. With only a very limited part of its strategic nuclear forces one of the major nuclear weapon powers could conceivably knock out the command and control system of its adversary (a "decapitating" strike).

In a situation of perceived severe crisis, these developments could give a high premium on striking first or striking back when indications of enemy attack are received (launch on warning). There would then be only a very short time for information-handling, decision-making and launching, since an intercontinental missile has a flight time of about 30 minutes and a submarine-based missile could approach half of that.

The command and control system is designed to enable the early detection and intepretation of any hostile acts so that an appropriate response can be made. The increasing sophistication of nuclear weapons in terms of higher accuracy and reduced flight times has greatly increased the difficulty of producing an integrated system capable of ensuring firm political control and effective military use of such weapons. In the command and control system false signals occasionally occur that are sorted out by comparing indications from different sensors. In a crisis situation with a perceived immediate threat, false or misinterpreted signals, lost connections, unidentified use of weapons combined with short time for cross-checking and decision-making could lead to mistaken decisions and to accidental nuclear war.

There have been numerous reports of false warnings due to various causes. They include misinterpretations caused by atmospheric disturbances, a meteorite shower, a flight of wild geese and a computer chip failure. In the systems used in the Soviet Union and the United States, however, any warning has to be confirmed by a second independent sensor system using a different physical technique for observation.

The reliability of military electronics is an increasingly important problem. There are at least three general types of electronic failures that have been well documented. The first involves items of electronic hardware. The second involves problems of interference with the electromagnetic environment in which the military systems operate. The third type of electronic failure is manifest in computer software. The larger and more complex a computer programme becomes, the more difficult it is to have confidence in the programme working correctly under all possible conditions.

Both machines and humans may be fallible, especially in wartime conditions. Chaos, stress, sleep deprivation, isolation and even drug or alcohol abuse may cause inaccurate judgments. Nevertheless, thus far there have been no reported losses, thefts or detonations of nuclear devices as a result of these problems.

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THE INF TREATY: ITS ORIGINS, CONTENT AND PROMISE

The signing of the INF Treaty by President Reagan and General Secretary Gorbachev, on 8 December 1987, marked the culmination of a negotiating process whose immediate origins date back more than a decade. In the United States, the Senate must first give its "advice and consent" before the Treaty can enter into force. This process of hearings and examination of the Treaty is under way. Thus, while the final outcome is yet to be determined, it is not too early to assess what has been accomplished.

The INF is accompanied by an Inspection Protocol, outlining the detailed modalities of the inspection regime; an Elimination Protocol covering how each item banned by the Treaty will be eliminated; and a Memorandum of Understanding on data, declaring type, number and location of each item to be eliminated, along with photographs of the systems to be eliminated, and diagrams of the sites to be inspected.

The Treaty is a legal document and its detail and phrasing reflect this. But, in essence it contains the basic arms-reduction goals and policy that the United States, in close consultation with its allies, has pursued since the formal INF negotiations opened in late 1981. These goals and policy were based in turn in NATO's December 1979 decision to overcome the challenge posed to the security of the alliance by the Soviet intermediate-range nuclear missile force through a dual track approach of counter-deployments and negotiations.

The United States Approach to the INF Negotiations

The negotiating approach the United States and its allies agreed upon was based on five principles: (1) equality of rights and limits between the United States and the Soviet Union; (2) limitations on United States and Soviet systems only; (c) global application of limitations; (4) unweakened maintenance of NATO's conventional defense capability; and (5) effective verifiability of any agreement.

While these principles were specifically designed to meet United States and allied requirements in the context of the INF negotiations and are fully incorporated in the INF Treaty, they have wider applicability. In addition to the principles, the United States and its NATO allies also made the incorporation into the INF Treaty of constraints on shorter-range INF missiles a fundamental tenet of the United States approach to negotiations.

Equal Rights and Limits

This fundamental principle is grounded in the Charter of the United Nations, which makes provision for the right of collective defense. In concrete terms, this right provides for the United States and its allies to join together in protecting their freedom and independence, including by basing American troops and systems in Europe.

The Soviet Union has long deployed missiles that could strike targets in Europe and Asia. Thus, the Soviets claimed, dealing with such systems was essentially an intra-European affair. The most recent example of this type of system was the mobile, accurate, triple-warhead SS-20, deployed in the mid-1970s. The SS-20 could threaten targets throughout Europe, and elsewhere on the periphery of the Soviet Union, including much of Asia. The United States had no comparable force. In addition to its SS-20s, SS-4s and SS-5s, the Soviet Union also had deployed almost 400 shorter-range INF missile systems (SS-12s and SS-23s), while the United States deployed 108 Pershing I-As until their replacement by Pershing IIs.

In the context of Soviet achievement of strategic parity with the United States and as the Soviet SS-20 missile force grew, our European allies became concerned that with no comparable United States INF forces on the ground in Europe, Moscow might come to believe-however mistakenly—that American forces could be “decoupled” from the defence of Europe. Consequently, Western European leaders stressed the need for a NATO response to Soviet SS-20 deployments, as much to foreclose a potential perceptual gap as to address a military threat.

Well over a year of intensive alliance consultations culminated in NATO’s December 1979 “two-track” decision. One “track” would redress the imbalance of INF through modernisation and deployment in Western Europe, starting in 1983, of 572 United States longer-range INF missiles. On the second “track”, the United States would call for negotiations with the Soviets to establish global balance in United States and Soviet longer-range INF missiles at the lowest possible level, which was understood to include zero.

A substantial portion of the negotiations was devoted to achieving Soviet recognition of the concept of "equal rights and limits". The Soviets initially refused to negotiate, attempting to impose the condition that NATO must first renounce its modernisation "track" and arguing that the United States had no right to deploy INF systems in Europe to help its NATO allies to counter the threat of the SS-20 and similar Soviet systems.

Finally, during the summer of 1980, the Soviets agreed to negotiate, and a short set of preliminary talks were held that fall. Formal negotiations with the Soviet Union began in November 1981. From the outset, the United States stressed the principle of equality and proposed the global elimination of all United States and Soviet longer-range INF missile systems. This global "zero option" remained the United States' preferred outcome throughout the negotiations. The Soviets called in essence for a "moratorium" on INF deployment in Europe. This would have codified the Soviet missile monopoly which NATO had just rejected.

In March 1983, in an effort to find common ground with the Soviet side, the United States, while continuing to prefer a zero outcome, proposed an interim agreement for equal global limits on long-range INF missile warheads at any number below the planned United States deployment level. Both of these proposals were rejected by the Soviet side, which eventually walked out of the negotiations in November 1983, following the *Bundestag* approval of deployments to the Federal Republic of Germany and initial Pershing II deployments.

Following the extended Soviet walkout, the United States and the Soviet Union returned to Geneva in March 1985. During the course of these renewed negotiations, the United States continued to stress that any INF agreement had to be based on "equal rights and limits". The Soviets, after renewing their freeze proposal, attempted to define equality as equal reductions. Eventually, however, the United States position was accepted.

Equal limits were agreed to, first at 100 warheads each and then at zero. The principle of an equal outcome and equal rights—even if one side had to take more reductions than the other—was incorporated in the Treaty.

Exclusion of Third Country Systems

This principle is closely connected to the issue of equal rights and limits for the parties to the Treaty. As part of its argument that the INF issue was an intra-European affair, and that Europeans and Americans had no need (or right) to join in a collective approach to counter Soviet INF, the Soviet side for much of the negotiations argued for the inclusion of, or compensation for, British and French systems. The United States insisted that any INF agreement must be bilateral and limited only to United States and Soviet systems.

Behind this argument lay the conviction of the United States and its allies that American INF deployments provided a legitimate counterweight to Soviet INF capable of reaching the European (and Asian) allies of the United States, and that any nuclear weapon negotiations between the United States and the Soviet Union should deal only with the systems of those two countries. The Soviets eventually accepted this principle. The Treaty deals only with United States and Soviet INF missile systems.

Global Application of Limitations

The Soviets sought initially to limit any INF agreement to Europe. The United States, by contrast, argued that given the range and mobility of SS-20s, an agreement limited to Europe would not provide real security for our European allies. We also stressed the requirement for equal security for Asian as well as European States. Ultimately, the Soviets accepted the validity of this argument. The Treaty's provisions apply on a world-wide basis.

Maintenance of NATO's Conventional Capabilities

This principle is directly related to the question of whether to include dual capable aircraft in the INF negotiations. The Soviets initially sought to include such aircraft in the INF negotiations in a manner that would have decimated United States aircraft in Europe. The United States argued that an agreement should focus on missiles only: the most capable element in the INF force. Moreover, for the United States and our allies, dual capable aircraft play an important role in NATO's conventional defence. In mid-1983, the United States, in an effort to meet Soviet expressed concerns, offered to discuss inclusion of selected INF aircraft in an agreement. The Soviet side, however, continued to propose an outcome that would have effectively undermined the contribution United States aircraft make to NATO's conventional defence. The question was finally resolved when, during the renewed negotiations, the Soviet side changed its position to correspond to the missiles-only approach, which the United States preferred. The Treaty, therefore, deals only with ground-launched missiles.

Effective Verification

Effective verification is the keystone of arms control. "Trust but verify" is more than a watchword for the United States, but a practical recognition of the problems created by Soviet non-compliance with arms control agreements. As detailed below, the procedures for verification in the INF Treaty are more comprehensive than in any previous agreement. The complex of constraints, inspections and notifications, coupled with national technical means (NTM), will greatly help to ensure compliance with the Treaty, i.e. that the Soviets eliminate the overt INF inventory declared in the Memorandum of Understanding, and that we have high confidence that the Soviets do not possess a militarily useful covert INF missile force.

Shorter-Range INF Missiles

From the outset of the negotiations in 1981, the United States called for treaty provisions placing constraints on shorter-range INF missiles. This was necessary because Soviet shorter-range INF missiles could perform some of the same missions as Soviet longer-range INF missiles. Thus, if left unconstrained, Soviet shorter-range INF missiles could undermine the effectiveness and viability of the Treaty.

After some hesitation, the Soviet side agreed with the concerns expressed by the United States and, indeed, included provisions dealing with shorter-range INF missiles in its initial draft INF treaty.

However, while the United States remained constant in its view of the need to constrain these systems, when the talks resumed in 1985, the Soviet Union raised objections to including shorter-range INF missiles in the proposed treaty. Instead, the Soviets argued that these missile systems should be dealt with in a follow-on negotiation. In time, though, the Soviet side accepted the United States view that shorter-range INF missiles had to be limited by an INF Treaty in order that the treaty would provide real security. Indeed, the sides eventually agreed to eliminate their shorter-range INF systems on the same global basis as their longer-range INF systems.

Treaty Provisions

As for the Treaty itself, it will:

(a) Totally eliminate, within three years, all United States and Soviet ground-launched ballistic and cruise missiles, i.e. those missiles with a range between 500 and 5,500 km (about 300-3,300 miles). Shorter-range missiles (500-1,000 km range) will be eliminated in 18 months. Intermediate-range missiles (1,000-5,500 km) will be eliminated in two phases. The first, lasting 29 months, will bring the sides to equal force levels prior to total elimination at the end of three years. Altogether, over 1,836 Soviet missiles, capable of delivering over 3,000 nuclear warheads, will be destroyed, along with over 850 United States missiles capable of carrying nuclear warheads;

(b) Prohibit production and flight testing of these systems or development of "new types";

(c) Institute restrictions on the deployment and movement of INF systems until they are eliminated, including an extensive process of notifications for and limitations on any movements;

(d) Update the data provided in a Memorandum of Understanding on data, which includes a fully itemised declaration of the location, number and technical specifications of all Treaty-limited systems, support structures and equipment;

(e) Provide detailed procedures for the elimination of INF missiles, launchers, support equipment and unique support structures;

(f) Provide a complex, overlapping inspection regime to assist in the verification of compliance to include several kinds of on-site inspection. The Treaty also sets up a Special Verification Commission as one means of addressing, as necessary, compliance concerns.

Just as its provisions calling for the elimination of an entire class of nuclear weapons are unique, the Treaty's extensive verification provisions break new ground. The verification regime, lasting 13 years and covering nine countries, is the most comprehensive and stringent ever agreed upon. It will consist of:

(a) "Baseline" inspections, to be conducted shortly after the INF Treaty enters into force to verify the number of missiles and launchers at "declared" facilities (including bases at which missiles are operating, repaired and stored);

(b) An annual quota of short-notice, on-site inspections of these INF facilities both for the 3 years during which all INF systems and facilities are eliminated and for 10 years afterwards. These inspections will help to verify residual levels until all United States and Soviet INF missile systems are eliminated and assure that no such systems are reintroduced;

(c) On-site inspections to verify the elimination of missiles and launchers, and elimination of specific structures at missile bases. Each side will also be permitted to eliminate up to 100 intermediate-range missiles in the first six months by launching them under restrictive conditions, monitored by on-site observation;

(d) A separate "close-out" inspection to assure that when a declared site is deactivated and removed from the list of declared facilities, INF-associated activity has indeed terminated;

(e) A perimeter portal monitoring regime under which the United States will be able to monitor, for up to 13 years, production at the key Soviet missile assembly plant at Votkinsk or any other plant where the SS-25 is produced. This monitoring will include the permanent presence of United States inspectors at the Soviet facility. They will be able to weigh and measure Soviet SS-25 canisters and open up eight canisters per year as they leave the plant to ensure the "non-production" of SS-20s, because the first stage of the Soviet SS-25 intercontinental-ballistic missile is outwardly similar to the first stage of the SS-20. The Soviet Union will similarly be permitted to monitor a former Pershing II production facility in Utah;

(f) A permanent flight test ban which, together with national technical means, will preclude the military utility of any covertly-produced INF missile.

To complement this inspection regime, and as a further step in helping to ensure that SS-20 missiles are not covertly deployed with SS-25 missiles, the Soviet Union has agreed to the establishment of a programme of enhanced national technical means. Six times a year for three years, or until entry into force of a START agreement (whichever comes sooner), the United States can require the Soviet Union to open retractable roofs and display SS-25 missile systems at selected SS-25 bases.

In sum, the verification regime of the INF Treaty provides an extensive network of checks and cross-checks appropriate to a zero level environment where the production, flight testing, indeed the very existence of such missiles is prohibited. It dramatically reduces the possibilities of maintaining a militarily useful covert INF missile force and serves as a deterrence to cheating.

Future of the INF Treaty

The INF agreement is of historic proportions. It is not hyperbole to note that never before have two world powers agreed to eliminate an entire category of weaponry, whether the weapons were battleships, bombers or ballistic missiles. The suggestion that INF missiles are superfluous when compared with vast numbers of strategic systems begs the question of why they were constructed or deployed in the first place, and forgets the deep concern which Soviet INF missiles engendered in Europe and Asia. Consequently, the Treaty will lift a significant element of threat from the citizens of Western Europe and Asia within the range of those missiles.

Without belabouring the point, it is clear that the elimination of this class of nuclear weapons, regardless of whether it is only one of many classes of nuclear weapons, is a significant step in arms control. But, diplomatic history is littered with wasted "significant steps" and the INF Treaty need not be seen as a last step. Rather, it should be seen as an example of the kind of stabilising and effectively verifiable agreement that improves security to the benefit of all.

Elements of the INF Treaty can provide useful precedents for the emerging conventional stability negotiations, as well as for START. Each of these negotiations, of course, has its own dynamic and requirements. Neither envisages a zero outcome. Nevertheless, recognition of the principle of equal rights and limits can be a useful precedent in other arms control talks. The sides could also draw from procedures in the INF Elimination Protocol or build on aspects of the INF Inspection Protocol in future negotiations.

More generally, the INF Treaty is a positive example of United States and Soviet determination and ability to resolve other controversial issues. The two countries have moved to resolve a security problem long considered intractable, involving key allies both in Europe and Asia. Other issues will not necessarily be easier to negotiate, but at the minimum an INF Treaty will demonstrate that tough problems can be solved. In addition, while our experience with previous nuclear arms control agreements with the Soviet Union has not always been a happy one, successful implementation and full compliance with the INF Treaty will provide an opportunity to establish a different record.

Finally, it remains fundamentally true that improved East-West relations cannot be based solely on arms control. Arms alone do not create insecurity. Arms are as much, if not more, a manifestation of tension as the cause of tension. Progress in arms control alone cannot therefore resolve United States-Soviet differences if we remain at odds over the rest of the spectrum of our relationship. To be of lasting benefit, movement in arms control must be paralleled by the resolution of problems in other areas such as human rights and regional issues, for example the continued Soviet occupation of Afghanistan.

Nevertheless, while there is more to be done in these fields as well as in arms control, the successful negotiation of the INF Treaty—and equally important its successful implementation—demonstrates and illustrates the point that even though initially separated by major political and security differences, the United States and the Soviet Union can ultimately find the way to agreement. The knowledge that agreement can be achieved in a sensitive area, despite major obstacles, should be among the most important legacies of the INF negotiations and Treaty.

A MAJOR ACHIEVEMENT TOWARDS NUCLEAR DISARMAMENT

The major event at the meeting last December at Washington, D.C., between the General Secretary of the Central Committee of the Communist Party of the Soviet Union, Mikhail Gorbachev, and the President of the United States, Ronald Reagan, was the signing of the Treaty on the Elimination of their Intermediate- and Shorter-Range Missiles. The leaders of the two powers affixed their signatures to the document, which has historic significance both in terms of Soviet-United States relations and in terms of advancement toward nuclear disarmament as a whole. It is deeply symbolic that the signing ceremony took place at the desk of Abraham Lincoln—the outstanding American political figure whose name is linked with important progressive changes in the history of the United States.

The path leading to the Treaty was not easy. The first step toward agreement was taken as far back as the autumn of 1980, at the preliminary Soviet-American consultations on the limitation of intermediate-range nuclear forces in Europe. They were later followed by official negotiations on the subject.

Yet, for a long time it proved impossible to find a common denominator—a basis on which to build a mutually acceptable agreement. It should be remarked that constructive movement in the negotiations was obstructed by NATO's large-scale deployment in Western Europe of American intermediate-range ballistic and cruise missiles directly targeted on the vital centres of the USSR and its allies.

To neutralise the threat, the Warsaw Pact countries were forced to respond in kind and deploy Soviet enhanced-range operational-tactical missiles in the territory of the German Democratic Republic and Czechoslovakia, with the consent of the Governments of those two countries.

As a result, however, the level of nuclear confrontation on the European continent—already chock-full of weapons of all kinds—reached a new high. It was becoming increasingly obvious that any further escalation of mutual nuclear threats made no sense. Europe's experience confirmed once again that in a nuclear age the uncontrolled stockpiling of weapons of mass destruction does not result in stronger security of States. It was imperative therefore to renounce the traditional dogmas of "diplomacy through force" and reliance on military power as the principal and ultimate arbiter in international relations. The belief was taking root that the concept of "mutual deterrence", which until the present had been in fact one of the prime movers of the arms race, should be supplanted with a new approach to policy-making, one that would ensure a solution to the problem of strengthening peace on Earth, reducing and eventually eliminating the threat of war. The needle on the foreign policy barometer was beginning to indicate a change in favour of taking practical steps to reduce drastically the level of nuclear confrontation and to strengthen the security of countries and peoples primarily by political methods, through greater mutual trust and by promoting peaceful co-operation among States in all areas, rather than on the slippery platform of the "balance of terror".

An important role in developing new approaches to policies was played by broad public movements, including those in Western Europe. Major European cities were swept by demonstrations, thousands strong, demanding that the nuclear threat be eliminated from this continent. For reasons that are readily understandable, the European peoples were particularly concerned about the build-up of intermediate-range nuclear missiles. So reduction—or still better, elimination— of these missiles became the first-priority political task for Europe. The anti-missile movement merged with powerful protests against the deployment of binary chemical weapons in Europe and with demands to reduce conventional arms.

Together with mass actions to end nuclear testing, the new approaches are part of a democratic and highly progressive struggle for the survival of mankind and for elimination of the threat of nuclear catastrophe. Responsible political leaders cannot possibly disregard these demands of a peace-loving public. The task now is to be able to translate them into a language of concrete action and agreements.

So, with a strong resolve to seek a solution to this pressing issue, in the spring of 1985, the Soviet side entered into nuclear and space talks whose agenda included consideration of the question of intermediate-range nuclear forces in Europe.

The programme proposed by Mikhail Gorbachev on 15 January 1986, for a stage-by-stage elimination of nuclear weapons and other means of mass destruction before the end of this century, provided an impetus of tremendous positive importance to the negotiations. One of its inalienable elements had to do with destroying Soviet and United States intermediate-range missiles in Europe. The Soviet programme of nuclear disarmament was reaffirmed in the decisions of the 27th Congress of the Communist Party of the Soviet Union, which formulated the strategy and doctrine of Soviet foreign-policy activities. The decisions of the Congress stipulate that the work to establish a comprehensive system of international security that would encompass all major spheres, such as political, military, economic, humanitarian and environmental, constitutes the principal thrust of Soviet State policy on the international arena.

These concrete manifestations of the new philosophy in foreign policy found their expression in the practical approach by the Soviet side to dealing with the problem of intermediate-range missiles in Europe. In the interest of achieving agreement and ending military competition in this dangerous area, the Soviet Union made a proposal to establish a mutual moratorium on the further deployment of Soviet and United States intermediate-range missiles in Europe, and later—in April 1986—introduced such a moratorium unilaterally. The Soviet Union agreed to consider the issue of intermediate nuclear forces (INF) separately from medium-range delivery aircraft. It also took some specific steps towards lowering the level of nuclear confrontation in Europe: the Soviet side removed its SS-5 medium-range missiles from its inventory (only six such missiles without nuclear warheads are now retained). It also went ahead with removing Soviet SS-4 medium-range missiles from the inventory.

The decisions reached on the INF issue during the Soviet-American summit meeting at Reykjavik constituted a major breakthrough towards an accord. It was agreed in the capital of Iceland to eliminate the Soviet and United States INF missiles in Europe, while each side would retain 100 warheads on such missiles—in the Asian portion of the

Soviet territory and on United States territory beyond striking range of the USSR. It was also decided to start negotiations immediately on missiles with a range of less than 1,000 kilometres. Moreover, the Soviet side agreed that the relevant British and French nuclear forces would not be taken into account in setting the above-mentioned agreed limits on Soviet and United States INF missiles.

The Reykjavik formula provided a tangibly accelerated momentum to the negotiations. But, even after the meeting in Iceland, the Soviet Union was forging ahead in the search for ways to reach a final agreement. Late in February of 1987, Mikhail Gorbachev declared that the Soviet side was willing to resolve the issue of intermediate- and shorter-range missiles without linking it directly to the issues of strategic offensive arms and outer space. It was also emphasised that immediately after the Treaty on intermediate- and shorter-range missiles was signed, the Soviet Union would withdraw its enhanced-range operational-tactical missiles from the German Democratic Republic and Czechoslovakia, which had been deployed in those countries in response to the appearance of American Pershing IIs and BGM-109G cruise missiles in Western Europe.

On 27 April 1987, the USSR delegation to the negotiations in Geneva introduced a draft treaty on intermediate- and shorter-range missiles, which took into account many provisions of the American draft and which was thus of a compromise nature. This step, taken by the Soviet side, made it possible, early in June of last year, to put together a first joint draft text of a treaty, which at first contained much bracketed language but which at the same time could serve as a sound basis for making further headway.

Another important action taken by the Soviet side in order to achieve a turnaround in the negotiations was Mikhail Gorbachev's proposal in July 1987—which was outlined in his interview with the Indonesian newspaper *Merdeka*—for a double global zero with respect to Soviet and United States intermediate- and shorter-range missiles. There is every reason to say that this constructive step opened the way to an agreement. In making this proposal, the Soviet Union affirmed its hope that the United States would not build up its nuclear arms in the Asian and Pacific region.

We should also stress the crucial role played by the meetings held between the respective foreign ministers during the preparation of the new Treaty. From April to November 1987, a period of very active and specific work on the Treaty, there were five such meetings held: in

April, September, twice in October and, finally, in November, immediately before the talks took place at the highest level in Washington. The Minister for Foreign Affairs of the USSR, Eduard Shevardnadze, and the United States Secretary of State, George Shultz, accomplished the task of paramount importance. As a result of the ministerial meetings, solutions were found to many issues of principle which had previously stood in the way of agreement.

The progress of the negotiations on intermediate- and shorter-range missiles along positive lines was facilitated by the successful completion of the Stockholm Conference on Confidence- and Security-building Measures and Disarmament in Europe and its decisions, as well as by the active promotion by the Soviet Union of the idea of establishing a structure for collective security in Asia.

The Treaty on intermediate- and shorter-range missiles is the newest step in efforts to lower the level of military confrontation and reduce the nuclear threat. For the first time, an agreement was reached to eliminate two classes of nuclear-missile arms of the Soviet Union and the United States. This agreement does not merely introduce constraining levels on these systems, or limit them, but precisely eliminates American and Soviet intermediate-range missiles, i.e. missiles with ranges between 1,000 and 5,500 km, as well as shorter-range missiles, which include missiles with ranges between 500 and 1,000 km. The Soviet side is to eliminate 470 deployed and 356 non-deployed intermediate-range missiles while, on the United States side, 429 deployed and 260 non-deployed such missiles are to be eliminated. The USSR is also to eliminate 926 deployed and non-deployed shorter-range missiles, and the United States 170 such missiles. Thus, a first significant step has been taken toward real nuclear disarmament.

The agreement reached specifies the elements of missile systems subject to elimination and the procedure for and methods of eliminating missiles, launchers and associated support equipment and structures. The intermediate-range missiles shall be eliminated within a period of three years in two stages, the first of which will last for 29 months. It is important to note that the elimination process is to commence simultaneously for both countries. The United States shall reduce all types of missiles on a proportional basis so as to maintain the initial ratio between ballistic missiles and ground-launched cruise missiles subject to elimination. Shorter-range missiles shall be eliminated within 18 months. Missiles are subject to elimination along with their re-entry vehicles, including 72 United States warheads for the Pershing I-A missiles of the Federal Republic of Germany.

The Protocol lists as methods of missile elimination explosive demolition and burning, or launch to destroy, for an agreed number of intermediate-range missiles (100 for each side). Missile front sections shall be demolished, and nuclear charges shall be available for utilisation.

Launchers and support equipment shall be eliminated by rendering them unfit for restoration. In addition, what used to be mobile launchers and missile transporters shall be permitted for utilisation in the national economy. Specially designated sites shall be provided for eliminating missile systems: eight in the Soviet Union and two in the United States.

Thus, the Protocol on the elimination of intermediate-range and shorter-range missiles contains exhaustive provisions on how the elimination of missiles shall proceed.

The Treaty takes a fresh approach to addressing and formalising verification issues. They are dealt with in full conformity with the nature of obligations assumed by the two sides and with the radical steps involving the elimination of relevant weapons. When drafting the Treaty, the Soviet side maintained an open and clear-cut position on verification issues.

It has been and continues to be our view that verification issues take on special relevance once we move to eliminating two classes of nuclear missiles. The feeling of certainty that the Treaty will be strictly complied with becomes not only a matter of confidence-building, but also of assuring legitimate security interests. It is for this reason that the Soviet side sought from the very outset agreement on an effective and stringent verification system in the framework of an intermediate- and shorter-range missile treaty, which would be based on the use of national technical means of verification combined with on-site inspections.

Base-line data to be supplied by the two sides, as called for under the Memorandum of Understanding which forms an integral part of the Treaty, will help to implement verification measures. Such data will include both quantitative indicators and some qualitative specifications of the weapons to be eliminated. We should also note the unprecedented detailed nature and amount of the data to be provided. To ensure stringent verification and implementation of the accord, the two sides agreed to place on the negotiating table some of the documents (including photographs of weapons, plans of missile operating bases, missile support facilities and missile production facilities), which previously had been kept in closely guarded safes, or "under seven seals", as it were. There one sees another graphic manifestation of *glasnost* at a new stage in the drive for nuclear disarmament, ushered in by this new Treaty.

One of the Treaty's particular features is that, in addition to the total elimination of all deployed and non-deployed intermediate- and shorter-range missiles, it also calls for ending their production. Adequate verification of compliance with that obligation is provided for. The two sides have agreed, among other things, that the end product manufactured at the Votkinsk Plant in the Soviet Union and at the Magna Plant in the United States shall be subject to continuous portal monitoring. This will give either side confidence that the Soviet Union has discontinued the production of SS-20 missiles and the United States the production of Pershing II missiles.

Periodic inspections shall serve to verify non-production of ground-launched ballistic missile and ground-launched cruise missile (GLBM and GLCM) launchers. The facilities that are subject to such inspections are listed in the Memorandum of Understanding.

On-site inspections are provided for both in Soviet and United States territory as well as the territories of other countries where the missiles to be eliminated are deployed, namely, the German Democratic Republic and Czechoslovakia, on the one hand; the Federal Republic of Germany, the United Kingdom, Italy, Belgium and the Netherlands, on the other.

Inspections on a quota basis may be conducted during the entire period set for the elimination of missiles (three years for the intermediate-range missiles) and within the next ten years. The Soviet Union and the United States shall have the right to conduct 20 such inspections annually during the first three years following the Treaty's entry into force, and also 15 and 10 such inspections annually during the subsequent first and second five-year periods respectively.

Besides continuous portal monitoring at production plants and inspections on a quota basis of non-production of ballistic and cruise missile launchers, provision is made for inspections to verify base-line data, inspections to ascertain elimination of missile operating bases and missile support facilities (other than missile production facilities), and inspections of the elimination process of intermediate-range and shorter-range missiles.

The two sides agreed on general obligations regarding the procedure for sending notifications of the intention to conduct an inspection, the obligations of the inspected and the inspecting side with respect to such notifications, the procedure for the entry, reception and delivery of inspectors to the inspection site, including the procedure for the use of monitoring devices, inspection-conducting general rules, etc.

Annexed to the Protocol are the Provisions on Privileges and Immunities of Inspectors and Aircrew Members. Procedures for conducting inspections in the territory of basing countries shall be set forth in agreements to be concluded with those countries pursuant to the relevant Soviet-United States understandings on the issue of inspections. As of today, agreements to that effect have been signed between the Soviet Union, the German Democratic Republic and Czechoslovakia, on the one hand; and the United States and six Western European basing countries, on the other. The Soviet Union and the Western European basing countries, as well as the United States, the German Democratic Republic and Czechoslovakia, have begun exchanging notes to set in motion the process of formalising such inspection agreements.

The Soviet-United States Agreement on Nuclear Risk Reduction Centres, which was signed by the Soviet Foreign Minister and the United States Secretary of State in Washington, D.C., in September 1987, has proved highly useful. The facsimile communications link between the two centres shall be used to transmit notifications and other relevant information related to the Treaty. In addition, the two sides have agreed to set up a Special Verification Commission, which shall meet to address and settle the issues related to compliance with the Treaty. Taken together, all the above measures provide for reliable verification of strict and unswerving compliance with the obligations assumed.

The signing of this Treaty signals a new, important impetus for real nuclear disarmament. It stresses the Joint Soviet-United States Summit Statement, adopted in Washington, which is historic both for its objective—the complete elimination of an entire class of Soviet and United States nuclear arms—and the innovative character and scope of its verification provisions. This mutual accomplishment makes a vital contribution to greater stability.

The task now is to make the Treaty effective, thereby assuring implementation of its far-reaching provisions. It is for Soviet and United States lawmakers to see to it that the Treaty is ratified. It is hoped that when making their decision, they will bear in mind both the merits of the Treaty and the fact that it has been acclaimed by the public at large as well as prominent politicians in many countries. Significantly, numerous comments in the world press indicate that the signing of the Treaty has been most enthusiastically welcomed throughout the globe. According to public opinion polls, the Treaty is endorsed by over 70 per cent of United States citizens. Such endorsement serves to provide graphic proof that ideas of disarmament and the people's quest for our planet's peaceful future do carry enormous weight.

In their assessment of the Treaty, serious analysts have concluded that it gives neither side any military advantage. Therein lies the guarantee of its effectiveness and vitality. The Treaty implies an equitable balance of Soviet and United States interests, a common victory of peace-loving forces, and a major contribution to greater security in Europe, Asia and throughout the rest of the world. In terms of its significance, the Treaty goes far beyond the framework of Soviet-United States relations. Many other countries, including Soviet and United States allies as well as non-aligned States, together with antiwar movements and peace-loving forces throughout the world, have been instrumental in bringing about the accord.

The Washington accords serve to promote progress in other arms control areas, namely, chemical weapons prohibition and destruction, cessation of nuclear testing, and conventional armed forces and armaments reductions in Europe from the Atlantic Ocean to the Urals. It is this background that makes particularly untenable the intention of certain NATO quarters to "offset" the elimination of two classes of nuclear arms on the continent by building up and modernising other types of arms.

What is also clear is that by building upon the experience gained during the drafting of the Treaty and its verification of compliance provisions, the Soviet Union and the United States will find it easier to take the next step in the most important area of nuclear arms limitation and disarmament, namely, to complete in time for the next Soviet-American Summit Meeting, set for the first half of 1988, drafting work on a treaty calling for a 50 per cent cut in strategic offensive arms, under conditions of non-withdrawal from the ABM (anti-ballistic missiles) Treaty for an agreed period of time.

The recently signed Treaty offers palpable proof that the idea of nuclear disarmament, consistently advocated by the Soviet Union, can be realised. The supreme leaders of the Soviet Union and the United States have given their two delegations in Geneva an agreed set of instructions to guide them in negotiating accords on the issues of strategic offensive arms and outer space. Provided the two sides demonstrate good will, this work may well be completed successfully in time to meet the deadline. The Soviet side is prepared for this work.

INF NEGOTIATIONS AND NUCLEAR DISARMAMENT

In a world characterised by incessant regional conflicts, the arms race and continued confrontation between the two major military blocs of the East and the West, the danger of war persists and the dark shadow of nuclear war looms large. People throughout the world who long for peace and development feel a strong desire for the prevention of nuclear war and for nuclear disarmament.

For some time now, the United States-Soviet disarmament negotiations have attracted the intensive attention of the international community. Fresh developments in the INF talks have been the object of even greater attention. How should one assess the INF negotiations between the two major nuclear powers and the agreement that they have reached? What is the relationship between these negotiations and the security of European and Asian countries? How should the elimination of the Soviet and United States intermediate-range nuclear missiles now deployed in Europe and Asia be perceived in the larger context of nuclear disarmament? What is China's position on the above issues?

China has always stood for the complete prohibition and thorough destruction of nuclear weapons. In our view, the United States and the Soviet Union, which possess the largest nuclear arsenals, bear a special responsibility for the cessation of the nuclear-arms race and the realisation of nuclear disarmament.

The United States and the Soviet Union were the two earliest producers of nuclear weapons, and now their nuclear arsenals account for over 95 per cent of the world's total. In an attempt to continuously reinforce their nuclear overkill capacity and to overwhelm each other, these two nuclear powers have carried out the greatest number of nuclear tests over the years and have deployed various types of nuclear weapons at home and abroad. They rely mainly on nuclear weapons in their rivalry for global hegemony, thus seriously threatening world peace and security. Paragraph 48 of the Final Document of the 1978 special session on disarmament points out that "in the task of achieving the goals of nuclear disarmament, all the nuclear weapon States, in particular those among them which possess the most important nuclear arsenals, bear a special responsibility

People throughout the world believe that the two major nuclear powers should take concrete action to halt the nuclear-arms race, and the representatives of the non-aligned countries and numerous other countries have stressed this view in their statements in the General Assembly and the First Committee. The principle that the countries with the largest nuclear arsenals bear a special responsibility for nuclear disarmament not only is recognised by the international community at large, but also is beginning to be acknowledged by the United States and the Soviet Union themselves. In their Joint Statement of 21 November 1985, at the Geneva summit, the leaders of the two countries expressed their belief that "a nuclear war cannot be won and must never be fought" and their intention to reduce nuclear weapons by 50 per cent.

In view of this, the Chinese delegation put before the General Assembly at its forty-first session a draft resolution on nuclear disarmament, which was adopted on 3 December 1986 as resolution 41/59 F. As recorded in the resolution, the General Assembly, "bearing in mind that the Governments and peoples of various countries expect that the Union of Soviet Socialist Republics and the United States of America will reach agreement on halting the nuclear-arms race and reducing nuclear weapons, so as to start the process of nuclear disarmament", urged those two countries, "which possess the most important nuclear arsenals, to discharge their special responsibility for nuclear disarmament, to take the lead in halting the nuclear-arms race and to negotiate in earnest with a view to reaching early agreement on the drastic reduction of their nuclear weapons". This resolution won the support of all member states, including the United States and the Soviet Union. Its unanimous adoption indicates that the correct and effective approach to nuclear disarmament is to have the two major nuclear powers take the lead in it.

The United States and the Soviet Union have been negotiating on nuclear-arms control for many years. Although they twice reached agreement on a ceiling on the number of nuclear weapons they could have (which was a lot higher than the actual number of nuclear weapons then in their possession), the arms race between them has been gathering speed, rather than slowing down, and has extended from the surface of the Earth and the sea into outer space. During the late 1970s and early 1980s, these two countries successively deployed intermediate-range nuclear missiles in Europe and Asia and suspended their negotiations for over one year. The peace-loving countries of the world were greatly concerned over this situation and strongly urged the two major nuclear powers to halt the arms race.

In March 1985, the United States and the Soviet Union resumed their negotiations and started to discuss separately the issues of strategic nuclear weapons, space weapons and intermediate-range nuclear weapons. Later on, the Soviet and American leaders met in Geneva and Reykjavik, and there has been some relaxation in East-West relations. Beginning in 1987, negotiations have focused on the INF issue. Whether they were to eliminate all or only part of their INF and whether they were to reduce them to zero throughout the world or merely in Europe, while still keeping some in Asia, had been not only the subject of hard bargaining between the two major nuclear powers, but also an issue of concern to all countries in general and those in Europe and Asia in particular.

China's position is that dialogue between the United States and the Soviet Union is better than confrontation, and that relaxation is better than tension in the relations between the two military blocs locked in grave confrontation. We sincerely hope that United States-Soviet negotiations will produce early disarmament agreements conducive to the relaxation of international tension and without prejudice to the interests of other countries. The nuclear weapons covered by the United States-Soviet INF agreement are but a very small portion of the huge nuclear arsenals of those powers. Nevertheless, if they actually take the step of eliminating all their intermediate-range nuclear weapons, it will be a welcome event.

In my statement at the Conference on Disarmament on 25 June 1987,I said:

> "On the issue of nuclear disarmament, world peace and the security of all countries are at stake. All countries have an equal right to participate in its discussion and settlement. Whether and how the Soviet Union and the United States will eliminate all their medium-range nuclear missiles in both Europe and Asia is an issue that not only concerns the two countries themselves, but also has a direct bearing on the security of European and Asian countries. Therefore, the positions of these countries deserve full respect and serious consideration. After repeated consultations, the West European countries not only support the United States in reaching an agreement with the Soviet Union on the 'zero-zero' formula for the elimination of all medium-range and shorter-range nuclear missiles in Europe, but also urge the global elimination of all medium-range nuclear missiles possessed by the Soviet Union and the United States.
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> "It is known to all that the security of Europe is important, and that the security of Asia is equally important. Why should 100 INF warheads be kept in Asia while such weapons are reduced to zero in Europe? Militarily,

> they pose a threat to the security of Asian countries; politically, it is not fair, and the European countries will not be at ease about them either. In the final analysis, such a solution will not necessarily be advantageous to the United States and the Soviet Union. Therefore, we hold that the medium-range nuclear missiles deployed by the Soviet Union and the United States in Europe and Asia should be reduced according to the same principle, simultaneously and in a synchronised and balanced manner, until their total destruction—hence a simple and straightforward 'zero option' in both Europe and Asia."

China's position has drawn the close attention of various sides. On 21 July, the Soviet leader, Mikhail Gorbachev, made a statement on the issue of eliminating all Soviet INF deployed in Asia. On 24 July, the spokesman of the Chinese Foreign Ministry made the following comment when speaking to journalists:

> "We have taken note of the remarks made by Soviet leader Gorbachev indicating the readiness of the Soviet Union to eliminate all its medium-range missiles deployed in Asia as well as the United States reaction to this. China has all along held that the security of Europe and that of Asia are equally important and that the medium-range missiles deployed by the United States and the Soviet Union in both Europe and Asia should all be destroyed. We sincerely hope that the United States and the Soviet Union will reach an agreement to that effect through serious negotiations and put it into practice, and we welcome their efforts in this regard."

China's Foreign Minister, Wu Xueqian, pointed out in his statement of 23 September in a plenary meeting of the forty-second session of the General Assembly that "if the United States and the Soviet Union could formally conclude an INF treaty and implement it by thoroughly destroying all their long-range intermediate-range and shorter-range intermediate-range missiles deployed in Europe and Asia, that would be a first step towards nuclear-arms reduction and would undoubtedly be welcomed". He added that naturally the "international community strongly hopes that the United States and the Soviet Union will drastically reduce their armaments as soon as possible, and that after reaching an INF agreement, they will proceed to conduct earnest negotiations on disarmament in other areas and reach agreements followed by effective implementation. They should not just stand still, let alone vie with each other in developing new types of even more sophisticated weapons in the wake of an agreement on dismantling INF missiles".

The United States and the Soviet Union should achieve concrete results in their protracted negotiations, take the first practical step in nuclear disarmament at an early date, and work to eliminate all their INF missiles deployed in Europe and Asia. Meanwhile, we should point out that so far there is no substantive progress in their negotiations on strategic nuclear weapons and space weapons. People throughout the world should be on guard against an attempt on their part to continue the arms race in various forms. In order to achieve true relaxation of tension in the international situation, we are entirely justified in insisting that the two major nuclear powers eliminate all their INF and drastically reduce all types of nuclear weapons deployed anywhere, inside and outside their countries, and halt the testing, production and deployment of all types of nuclear weapons.

China as a nuclear State will not shirk its responsibility for nuclear disarmament. Its possession of a small number of nuclear weapons is entirely for the purpose of self-defence. China has exercised great restraint in developing nuclear weapons, and is of the view that the two major nuclear powers should take the lead in halting the testing, production and deployment of all types of nuclear weapons and in drastically reducing those that they have deployed. After that, a broadly representative international conference on nuclear disarmament could be convened with the participation of all the nuclear States and other States to discuss steps and measures to be taken for further disarmament by the United States and the Soviet Union and for the participation in that process of other countries so as to create conditions for the final elimination of all nuclear weapons.

It is China's consistent view that all nuclear States should undertake not to be the first to use nuclear weapons under any circumstance and not to use or threaten to use nuclear weapons against non-nuclear States and nuclear free zones. On 16 October 1964, the very day that China came into possession of nuclear weapons, the Chinese Government solemnly declared that it would undertake unconditionally not to use nuclear weapons against non-nuclear States and nuclear free zones. It is in favour of concluding an international convention prohibiting the use and threat of use of nuclear weapons against non-nuclear States.

China respects and supports the efforts made by the States concerned to establish nuclear weapon free zones in accordance with the conditions in their own regions and on the basis of consultations. In our view, nuclear weapon States should respect the proposals of these countries and the status of nuclear free zones, and they should accordingly assume relevant obligations. Proceeding from this position, China supports and has supported proposals for establishing nuclear weapon free zones in Latin America, the South Pacific, Africa, the Middle East, South Asia and the Korean peninsula. It has signed Protocols to the Treaty for the Prohibition of Nuclear Weapons in Latin America and the South Pacific Nuclear Free Zone Treaty.

China is for the principle of the non-proliferation of nuclear weapons. Its nuclear co-operation with other countries is confined to the peaceful use of nuclear energy. As for the Treaty on the Non-Proliferation of Nuclear Weapons, it has been justly pointed out that the obligations assumed under it by, on the one hand, nuclear States and, on the other, non-nuclear States are unbalanced and unfair. The Treaty limits only horizontal proliferation and places no limits at all on the continuous expansion and improvement of the nuclear arsenals of the Super-Powers. That is why China has reservations on and is critical of the Treaty.

Peaceful uses of nuclear energy are playing an increasingly important role in the economic and social progress of various countries. However, nuclear energy has been used to manufacture weapons, which have become tools in the hands of the Super-Powers in their search for military superiority and thus pose a grave threat to the entire human race. This reminds me of an ancient legend in China called "Hou Yi Shooting Down the Suns". As the legend has it, once upon a time there were 10 suns in the sky. All the crops, forests and grassland were scorched. An archer by the name of Hou Yi valiantly shot down nine of them, leaving only one in the sky. From then on, the normal growth of farm crops, grass, trees, and so forth became possible, and tranquillity and stability reigned under heaven. Complete and thorough nuclear disarmament cannot be accomplished overnight. We believe, however, that as long as the people of the world join together to make unremitting efforts, nuclear war can be prevented and peace maintained.

In its October 1964 statement, mentioned above, the Chinese Government solemnly declared:

> "We sincerely hope that nuclear war will never break out. We are deeply convinced that nuclear war can be prevented so long as all the peace-loving countries and peoples of the world make common endeavours and persevere in the struggle. We firmly believe that as nuclear weapons are made by men, they can be certainly eliminated by men."

INF'S IMPACT ON OTHER ARMS LIMITATION NEGOTIATIONS

The year 1987 was especially active for arms control in Europe. The Soviet Union at long last accepted the 1981 United States proposal to ban all land-based intermediate-range nuclear force (INF) missiles on a global basis. On 18 September, the two nations announced agreement in principle on an INF treaty. The INF Treaty, signed on 8 December, constitutes not only the first nuclear arms control regime in Europe, but the first agreement in history requiring substantial reductions in nuclear weapons— involving the destruction of 859 United States and 1,752 Soviet missiles over three years.

In addition, both NATO and the Warsaw Treaty tabled draft proposals at the Vienna conventional stability negotiations, under way since 17 February 1987, for conventional force arms control talks "from the Atlantic to the Urals". The talks, to begin formally in 1988, are expected to advance several orders of magnitude beyond their predecessor, the Vienna Talks on Mutual Reduction of Forces and Armaments and Associated Measures in Central Europe (MBFR), begun in 1973. Whereas MBFR was confined to negotiations on common manpower ceilings in Central Europe, NATO has proposed that the new conventional stability talks address main combat weapons as well as troops, and that they aim at nothing less than the elimination of disparities on a pan-European scale.

At the Vienna review conference of the 35-State Conference on Security and Co-operation in Europe (CSCE), work progressed on a mandate for a second phase of the CSCE Conference on Confidence- and Security-building Measures and Disarmament in Europe (CDE). The first phase of the CDE resulted in an agreement on 19 September 1986 in Stockholm, making it the first arms control agreement achieved since SALT II. The Stockholm accord provides for several new measures for the mandatory notification, observation, and inspection of military exercises and concentrations in Europe, in order to reduce the risks of confrontation by miscalculation or misunderstanding, and to diminish opportunities for sudden attack. The second phase of the CDE is expected to build upon the Stockholm accord and introduce new measures providing for constraints on military activity by size, timing, location or other attributes, so as to help ensure that even fully notified activities cannot in themselves hold the potential for aggression.

In short, NATO is clearly on the verge of an era that could witness profound developments towards a more stable East-West military equation. Apart from progress on European arms control, drastic reductions in United States and Soviet strategic offensive forces may also prove possible, provided the Super-Powers can agree on their precise rights and duties under, as well as the future of, the 1972 anti-ballistic missile (ABM) Treaty.

However, 1987 also brought into sharper relief the variety of approaches taken within and among NATO States towards the appropriate relationship between arms control and defence strategy. Although frequently distorted in the media as a difference in point of view between slack-witted pacifists and nuclear weapon addicts, the controversy demonstrates deep-rooted apprehensions that directions in bilateral and multilateral arms control negotiations may prove undesirable from the perspective of NATO's strategy of flexible response. Flexible response envisages defence against aggression along a spectrum of options ranging from direct conventional defence, through deliberate escalation to nuclear war, to general nuclear response—with the threat of United States strategic retaliation providing the ultimate sanction. However, if in the next century one or both of the Super-Powers deploys near-perfect strategic defences and nuclear weapons are substantially reduced, flexible response will obviously assume a very different character, with increased emphasis on conventional weapons.

The downgrading of nuclear weapons, indeed, appears to be the direction Soviet military doctrine and arms control policy have assumed: "the concept of an independent conventional war that excludes the nuclear forces of the superpowers may well be the essence of the new revolution in Soviet military doctrine". But, NATO has simply not thought through the operational consequences of reduced reliance on nuclear weapons, despite ritualistically favouring such cuts in its declaratory policy, as most directly evidenced by the controversy surrounding the "double-zero" INF proposals. As Phil Williams has observed, today NATO is an alliance in greater flux than ever before, on a new journey to an unknown destination.

On 12 June 1987 in Reykjavik, the North Atlantic Council attempted to impose some clarity on the debate by delineating in extremely general terms a comprehensive approach to arms control and disarmament. This framework comprises: (a) elimination of United States-Soviet land-based INF missiles between the ranges of 500 and 5,500 kilometres on a global basis; *(b)* a 50 per cent reduction in United States-Soviet strategic offensive forces (no mention is made of defence and space arms apart from endorsing the Geneva negotiations); (c) global elimination of chemical weapons; *(d)* elimination of conventional force disparities from the Atlantic to the Urals; and *(e)* in the context of items (c) and *(d)*, negotiations on reducing United States-Soviet land-based nuclear weapons of under 500 kilometres, so-called tactical nuclear weapons. On 25 September, the North Atlantic Assembly, the interparliamentary organisation of NATO, debated these questions at its 33rd annual session, held in Oslo. The prospects for each option and an overview of the divergent approaches taken by NATO Governments and parliaments are reviewed below.

Fear of Zero

On 12 October 1986, President Reagan and General Secretary Gorbachev agreed in Reykjavik to eliminate all United States and Soviet land-based longer-range intermediate-range nuclear forces with a range of 1,000-5,500 kilometres. Eight months later, on 12 June 1987, in the same city, the North Atlantic Council approved a Soviet proposal put forward on 14 April to eliminate shorter-range INF (SRINF) missiles with ranges of 500-1,000 kilometres. With Soviet agreement on 21 July to eliminate these missiles globally and not only in Europe, this "double zero" understanding would eliminate the launchers for 1,435 Soviet SS-20 and SS-4 warheads and 132 SS-12/22 and SS-23 warheads. In exchange, the United States would remove 108 Pershing II and 240 ground-launched cruise missiles (GLCM) from a total of 572 missiles planned for 1989, absent an arms control agreement. The United States has proposed that SRINF be eliminated within one year and LRINF within three years; the Soviet Union has proposed two and five years, respectively.

The double zero agreement is the first arms control agreement entailing deep and unequal reductions in nuclear weapons and substantially favouring the NATO alliance. For the first time since 1955 no Soviet LRINF missiles threaten Europe. The accord is also the first to involve intrusive verification measures, including permanent on-site monitoring and inspection, of importance as a precedent for other negotiations.

Equally important, the agreement may help to repair the damage done to Western defence consensus by vindicating the rationale of the 1979 NATO dual-track decision, which called for the United States deployments in tandem with negotiations aimed at achieving equality in rights and in limits. Only two months before the Reykjavik summit, the West German Social Democratic Party (SPD), at its August conference in Nuremberg, had proposed that United States LRINF missiles be withdrawn, but that Soviet SS-20s be reduced only to their 1979 levels (about 120 launchers).

However, the closer the Super-Powers came to agreeing on a double zero, the more NATO anxieties increased. For example, former French

Prime Minister Raymond Barre, whose country withdrew from NATO's integrated military structure and made the possibility of making French territory a sanctuary in the event of war in Europe a fundamental, if illusory, political principle, complained, ironically, that the zero LRINF option would decouple the United States from the defence of Europe: "Decoupling, however great the United States' political will to avoid it, would be technically and psychologically facilitated in practice by the withdrawal of the Pershing and ground-launched cruise missiles, since the United States would no longer be able to retaliate from Western Europe against the Soviet homeland" (which is factually incorrect in the light of the United Kingdom-based F-llls). Except for the Netherlands, and possibly Belgium, most NATO Governments would have preferred some level of United States LRINF missiles on their territory, the figure of 100 warheads being commonly suggested. Opposition socialist parties in the basing countries, however, favoured complete removal.

Similar concerns also attended the 14 April Soviet zero SRINF proposal. Because the United States deployed no such missiles in Europe, the Reagan Administration and most allies favoured the concept. The Government of the Federal Republic of Germany, however, expressed serious reservations. Indeed, Defence Minister Manfred Worner had proposed deploying about 80 Pershing IBs—a 720 kilometre-range missile of greater accuracy than the Pershing IA, of which 72 launchers belong to the Luftwaffe with their warheads under United States control—among United States and allied forces.

On 4 June 1987, the Bundestag finally approved Gorbachev's SRINF proposal by 43 votes, albeit on the condition that the 72 existing West German Pershing IAs not be affected. The United States position was that these missiles could be modernised with the Pershing IB or another system, even though missiles in this range would not be permitted for the United States, because the Federal Republic of Germany was not a party to the talks. The Soviet Union, however, made inclusion of the United States warheads for the West German Pershing IAs a central demand at the negotiations. Concerned that the Government's position could retard prospects for a quick agreement, however, the West German Free Democratic Party and SPD urged the Government to bargain the Pershing IAs away and to forgo modernisation. On 26 August, Chancellor Kohl announced that the Pershing IAs would not be modernised and would be dismantled after both Super-Powers completed reductions in accordance with the treaty—a decision supported by 86 per cent of the West German public. On 2 September, the United States announced that United States warheads would be withdrawn, although not as a formal treaty obligation.

Franz-Josef Strauss, leader of the Christian Social Union, protested Kohl's offer on the grounds that removing the Pershing IAs would leave the Federal Republic of Germany vulnerable to shorter-range Soviet missiles not taken into account by the double-zero agreement, and would decouple the United States from the defence of Europe. President Richard von Weizsacker stated on 3 September that "after an INF agreement, there is badly needed an ongoing negotiation on the weapons below the range of 500 kilometres and on the question of conventional arms". British Prime Minister Margaret Thatcher, on 2 April, informed the House of Commons that "the United Kingdom would not be prepared to accept the denuclearisation of Europe, which would leave us dangerously exposed to Soviet superiority in conventional and other forces".

Are these critics of double zero correct in their assumptions, or is too much being made of an agreement that, in fact, removes only a fraction of the entire United States global nuclear stockpile? Much of the debate can be reduced to whether the Pershing II and GLCM are required regardless of the systems they are being traded away for—Soviet SS-20s and SS-4s, or whether such an exchange is a good deal for NATO.

The principal argument in favour of double zero and the official United States policy is that the Pershing II and GLCM were necessitated by Soviet deployment of the SS-20. With the elimination of the SS-20, the rationale for the United States missiles disappears.

Moreover, double zero can hardly be characterised as a step towards the denuclearisation of Europe. Even if all United States INF missiles are removed, 4,600 United States warheads will remain in Europe, including those assigned to long-range F-lll bombers, and the 400 sea-launched ballistic missile warheads assigned to the Supreme Allied Commander Europe (SACEUR). In addition, a double-zero agreement will only affect land-based systems. According to Defence Minister Worner: "It is now a question of maintaining the option of a strike into the heart of the Warsaw Pact or the territory of the Soviet Union through the modernisation of air- and sea-based systems", for example, by deploying B-52 bombers in Europe, developing an air-launched long-range cruise missile on aircraft based in Europe, or deploying sea-launched cruise missiles assigned to SACEUR.

Finally, even if new INF systems are not deployed, deterrence will persevere in Europe by virtue of the presence of United States troops and the threat of strategic nuclear retaliation. According to the Director of the United States Arms Control and Disarmament Agency, Kenneth L. Adelman: "The Alliance has done well for thirty-five years without each step of the escalation ladder [the NATO flexible response spectrum] being in place."

But, there are equally compelling arguments against the agreement. The foremost is that NATO requires INF modernisation regardless of the SS-20 to ensure that NATO has at its disposal the means to strike Soviet territory from Western Europe; otherwise, the threat to escalate directly to a central strategic nuclear exchange from a conflict not involving strikes against Super-Power territory (that is, confined to Europe) might seem less plausible. Although, as noted, NATO could opt for air- and sea-launched systems, problems of penetrating air defences of the former and command and control of the latter make these options less attractive in some respects than land-based systems, although the sea-basing alternative would prove the more secure in terms of pre-launch survivability. For these reasons, the Supreme Allied Commander Europe, General Bernard W. Rogers, publicly opposed double-zero shortly before retiring in July. His successor, General John Galvin, has stated that double zero would not render flexible response invalid, but that in the light of an agreement, "the means to implement NATO strategy will require buttressing."

There is also concern that INF will propel unwarranted expectations about arms control at the price of defence. Thus, as NATO Secretary-General Peter Lord Carrington informed the North Atlantic Assembly on 24 September: "One swallow does not make a summer... nothing has changed so far as to alter the sobering disparities in the conventional military balance or the need for NATO to retain a range of credible nuclear options in its deterrent." There is some concern, for example, that West German eagerness to begin negotiations on weapons under the 500-kilometre range could lead to undesirable consequences, as discussed later.

Despite the agreement, both sides will still have ample means of delivering nuclear weapons at less than strategic range, such as aircraft and, for the Soviet Union, variable-range intercontinental ballistic missiles and sea-launched ballistic missiles. As nuclear arms control, INF pales in comparison to the question of strategic offensive and defensive arms, discussed next. However, as a political issue, although the agreement is essentially a victory for NATO, the INF controversy demonstrates the uncertainty within NATO regarding the most appropriate course to pursue in arms control negotiations and the tension between proposals intended to exert maximum impact on public opinion and perceived politico-military requirements.

THE OFFENSIVE-DEFENSIVE CONUNDRUM

The NATO Reykjavik communique states with reference to the Geneva negotiations on strategic offensive and space arms:

> "We reiterate the prime importance we attach to rapid progress towards reductions in the field of strategic nuclear weapons. We, thus, welcome the fact that the US and the Soviet Union now share the objective of achieving 50 percent reductions in their strategic arsenals. We strongly endorse the presentation of a US proposal in Geneva to that effect and urge the Soviet Union to respond positively.
>
> "We reviewed the current phase of US-Soviet negotiations in Geneva on defence and space systems which aim to prevent an arms race in space and to strengthen strategic stability. We continue to endorse these efforts."

This laconic statement is a reflection of the profound differences between the United States and its European allies concerning the future of strategic deterrence. The ministers "reviewed" the Geneva space defence negotiations and could only agree that they should continue. No substantive recommendation is contained in the second paragraph, except for a ritualistic reference to the purpose of the negotiations, which can be interpreted according to individual preference. On the other hand, there is full agreement regarding the desirability of achieving, and rapidly at that, a 50 per cent reduction in American and Soviet strategic arsenals. Why this difference?

European attitudes towards strategic arms control since Reykjavik are apparently inconsistent. In the aftermath of the Reykjavik summit, European leaders sharply criticised the idea of 100 per cent cuts in ballistic missiles or the abolition of all nuclear weapons, the latter which General Secretary Gorbachev claimed President Reagan agreed to orally. For example, on 28 October 1986, British Defence Secretary George Younger called the Reykjavik negotiations a "hastily patched together and superficially attractive deal... which would be disastrous for us all". He was referring to the American proposal to eliminate all ballistic missiles. Yet, European leaders and defence policy elites by and large agree on the desirability of 50 per cent reductions in United States and Soviet strategic arsenals. Why stop there though? And what role does space defence have in explaining this apparent inconsistency?

Although there has been a consensus within the alliance for some time that conventional defences ought to be strengthened, the United States nuclear guarantee to Europe in the form of American strategic forces has always been understood to be the linchpin of NATO's overall deterrence posture. Hence, the stunned European reaction to an American president contemplating the dismantlement of all ballistic missiles (and perhaps all nuclear weapons), without so much as informing, let alone consulting, the allies (or, for that matter, his own joint chiefs of staff). If President Reagan was only engaging in political theatre, this was distressing; if not, it was doubly distressing for the President to consider abandoning the strategy of extended nuclear deterrence which has served the alliance so well for so long. It is also ironic that there is an apparent coincidence of views between the European left and the long-term goals of President Reagan *vis-a-vis* nuclear weapons.

However, 50 per cent reductions in the Super-Powers' strategic arsenals seem desirable to the Europeans. Reductions in, instead of merely ceilings on, nuclear weapons would serve notice that negotiated arms control pays tangible dividends. And, most importantly, the West's security would be provided for at a lower level of nuclear weaponry. What matters to Europe is that America maintains nuclear forces along the whole spectrum of nuclear weaponry (hence the misgivings of some Europeans about an INF accord), not really the number of weapons in American possession. But, Europeans also recognise that strategic parity, particularly in the context of the military imbalance in Europe, make the "coupling" problem more acute than ever before. As Helmut Schmidt put it in his influential October 1977 Alastair Buchan Memorial Lecture:

> "SALT codifies the nuclear strategic balance between the Soviet Union and United States. To put it another way: SALT neutralises their strategic nuclear capabilities.... But, strategic arms limitations confined to the United States and the Soviet Union will inevitably impair the security of the West European members of the Alliance *vis-a-vis* Soviet military superiority in Europe if we do not succeed in removing the disparities of military power in Europe parallel to the SALT negotiations. So long as this is not the case we must maintain the balance of the full range of deterrence strategy. The Alliance must, therefore, be ready to make available the means to support its present strategy, which is still the right one, and to prevent any developments that could undermine the basis of this strategy."

The words "full range" are crucial here. In retrospect, it is clear that the former Chancellor was making a veiled request for American deployment of theatre nuclear forces capable of reaching the Soviet Union from European territory, in the absence of arms control (Schmidt today supports the zero option). The point is that as long as the United States maintains a full range of nuclear options, nuclear reductions can be contemplated safely, which is why the Europeans view the prospect of 50 per cent cuts in the strategic arsenals of the Super-Powers positively, or at least with equanimity.

Enter SDI, the apparent obstacle to a historic strategic arms control treaty. Europe thought it had controlled this genie in December 1984 when Margaret Thatcher announced four conditions for British agreement with the United States on SDI. These have subsequently become known as the "Thatcher four points" and have become the "holy writ" for European support for SDI. They are:

(a) The United States and Western Europe's aim is not to achieve superiority but to maintain balance, taking account of Soviet developments;

(b) SDI-related development will, in view of treaty obligations, have to be a matter for negotiations;

(c) The overall aim is to enhance, not to undermine, deterrence;

(d) East-West negotiations should aim to achieve security at reduced levels of offensive systems on both sides. This will be the purpose of the resumed United States-Soviet negotiation on arms control.

The European view of the Administration's "broad interpretation" of the ABM Treaty, which allows for the development and testing of space-based defences if they are based on "exotic" or futuristic technologies, is thus that it should be subject to negotiation at the Geneva nuclear and space talks (NST). Any early deployment of SDI should also be a matter for negotiation in the European view. Thus, compared to the North Atlantic Council communique of 12 June, the North Atlantic Assembly plenary resolution of 25 September places great stress on a predictable ABM Treaty environment.

The Thatcher four points testify to European concerns with strategic stability, deterrence (meaning nuclear deterrence) and arms control. It is worth pointing out that these concerns are largely shared by both right and left (except for the British Labour party regarding nuclear deterrence). They are at the heart of European scepticism towards SDI. In addition, the United Kingdom and France have their own reasons for wanting to maintain the ABM Treaty. Moreover, there are technological and economic concerns regarding strategic defence.

The aim is not for one Super-Power to achieve superiority. On the contrary, "balance" is desired. This means that Europeans do not want one Super-Power to gain superiority through building more strategic weapons than the other Super-Power or through installing strategic defences. A related problem is what happens during the celebrated transition phase of building up strategic defences. Manfred Worner, the German Minister of Defence, has stated that "it would be intolerable, for example, for one of the two superpowers to gain a one-sided lead in setting up such a system. The superpower with the advantage would then have absolute superiority and the other power would basically have to submit. The strategic balance would then be upset."

There is another problem in this context. Although the President talked of rendering offensive forces "impotent and obsolete" in his 1983 "Star Wars" speech, there are fears that any move towards strategic defence on the part of one or both of the Super-Powers would lead instead to an offensive arms race spiral in which the Super-Powers would attempt to increase their strategic forces in order to overwhelm each other's defences or to concentrate on air-breathing systems employing stealth technology that SDI does not address.

Nuclear deterrence is another great European preoccupation. Put plainly, nothing should undermine the American nuclear guarantee to Europe. Assuming that the United States, the Soviet Union, and Europe (through the development of anti-tactical ballistic missiles (ATBMs) were invulnerable to nuclear attack, then nuclear deterrence would, by definition, be impossible.

What would be the effect of an exclusively American shield though, or rather a defence system aimed at United States superiority in strategic defence? Would not a reversion to the situation in the 1950s, when the United States possessed strategic invulnerability, strengthen, rather than weaken, the United States nuclear guarantee to Europe? Strangely, this question is rarely posed in such bald terms, perhaps because President Reagan himself talked of sharing SDI technology with the USSR in his March 1983 address (subsequently changed to sharing the "benefits" of SDI research), thereby, making an exclusively American shield an academic scenario (although few believe that the sensitive technologies would be shared in any literal sense). And if the United States should decide to build an exclusive shield, the Europeans believe that the likeliest result of such an attempt would be a fuelled arms race. And, of course, were near-perfect population defences deployed, the chances of a nuclear war not escalating to the strategic level might be increased, thereby increasing the risk of a limited nuclear war in Europe.

And then arms control. It is difficult for Americans to appreciate the political centrality of arms control in Europe, or, some would say, at least the appearance that Governments are negotiating. In particular, it is difficult for the Reagan Administration to appreciate the depth of European attachment to the ABM Treaty. It is explicable, however, if two fundamental aspects of the Treaty are recalled. First, it codifies the principle of offensive nuclear deterrence, since it severely limits ballistic missile defence. Secondly, it provides a strategic environment which allows for the reduction of strategic offensive forces: if there are no defences to defeat, then it is not necessary to have so many nuclear weapons, so the logic goes. In other words, the ABM Treaty makes strategic arms control possible, even though, from 1970 to 1984, United States strategic nuclear warhead levels tripled and Soviet warhead levels increased by 500 per cent.

The increase in warhead levels helps to explain the relative lack of American interest in continuing to adhere to the ABM Treaty. As Ambassador Gerald Smith put it in a unilateral statement made in connection with the signing of the ABM Treaty:

> "If an agreement providing for more complete strategic offensive arms control limitations were not achieved within five years, U.S. supreme interests could be jeopardised. Should that occur, it would constitute a basis for withdrawal from the ABM Treaty."

The increase in the number of Soviet heavy ICBMs and their increasing accuracy led to a fear some time ago in the United States that the USSR might be capable of mounting a successful first-strike against American land-based nuclear deterrent forces. Strategic defences, capable of defending the United States land-based deterrent, would overcome this problem. From this perspective, SDI makes strategic sense, since the programme is rapidly becoming a point defence programme in fact, if not on the level of public rhetoric. It would also not contradict the European view that nuclear deterrence must remain the mainstay of Western security, since point defence would enhance the survivability of the United States land-based strategic deterrent. But, of course, if the Super-Powers could agree to deep strategic cuts (especially in the USSR's heavy land-based ICBMs), strategic defence could presumably become unnecessary. This is by far and away the preferred European solution.

Unlike the Reagan Administration, the major NATO European Governments view mutual assured destruction not as a mutable condition if SDI is pursued, but as a strategic fact of life. As the British Foreign Secretary, Sir Geoffrey Howe, said in a remarkable speech on 15 March 1985:

> "We must be especially on our guard against raising hopes that it may be impossible to fulfill. We would all like to think of nuclear deterrence as a distasteful but temporary expedient. Unfortunately, we have to face the harsh realities of a world in which nuclear weapons exist and cannot be disinvented. Words and dreams cannot by themselves justify what the Prime Minister described to the United Nations as the perilous pretense that a better system than nuclear deterrence is within reach at the present time."

As small nuclear powers, the United Kingdom and France naturally have a special interest in maintaining the current reliance on offensive strategic forces for deterrence, while sharply curtailing defensive systems. Their current nuclear forces' deterrent value would be drastically limited, if not obviated, in the event that the Soviet Union deployed full-scale strategic defences. This is the case even when the British and French strategic modernisation programmes (which provide for a substantial increase in the number of deliverable warheads) are taken into account. Given the investment the United Kingdom and France are making in their strategic forces, to the detriment of conventional forces, it is clearly not in the two countries' interest to change the strategic environment, especially if it would in practice lead to a devaluation of their heavy strategic investment at a time when added importance would inescapably be put on conventional forces, if strategic defence became the norm.

In this context, it might well be asked what motivates the United Kingdom and France to persist in maintaining, and indeed expanding, their nuclear forces. Aside from the lingering great-Power aspirations both nations share, the British and French rationales for their nuclear programmes are not entirely similar.

The British tend to emphasise the added complication for Soviet leaders of an independent British nuclear deterrent should the USSR ever consider embarking on a war in Europe. Thus, the 1987 British White Paper on Defence states:

> "Although the mainstay of the Atlantic Alliance's deterrent forces is provided by the United States, the presence of an independent nuclear deterrent under absolute British control greatly complicates the calculations that would have to be made by anyone contemplating an attack on

Britain or our allies, and helps make aggression an unacceptably risky option."

France has always stressed the role of her nuclear weapons in deterring an attack on the French "sanctuary" (despite much talk of extending French nuclear protection to the Federal Republic, French nuclear weapons are still meant to defend only France). Moreover, the French are the most steadfast expositors of the idea that only nuclear weapons can deter war. As Pierre Gallois, responsible for formulating much French doctrine concerning the country's "force de frappe", stated in an interview:

> "For us nuclear weapons are the only weapons which can intimidate a large power. We cannot imagine a defense which would rely on combat with the Soviets, because they would win. Highly civilised and advanced countries are not prepared to make sacrifices in conventional combat. The solution must be more deterrence-oriented."

But, is nuclear-arms control only desirable for the Super-Powers in France's and the United Kingdom's estimation? The two countries' stock reply to this question is that their nuclear forces are negligible in comparison to the Super-Powers' and that they will only be drawn into nuclear-arms control negotiations when the Super-Powers agree on deep strategic cuts. For example, the 1987 British White Paper on Defence states that only "if U.S. and Soviet strategic arsenals were to be very substantially reduced, and no significant change had occurred in Soviet defensive capabilities," would the British Government consider involving the British nuclear deterrent in arms control negotiations. But, the two European Powers do not say how deep the cuts would have to be for them to contemplate reducing their own arsenals. However, if further progress is made between the United States and the Soviet Union on strategic arms control, great pressure will inevitably be put on these two powers to reveal their true colours as to what they will accept with regard to curbs on their own nuclear forces.

In this context, the West German decision to abandon the Pershing IA may constitute an unwelcome precedent for London and Paris, as the Soviet Union may believe itself to be in a better position to seek restrictions on British and French nuclear forces—which it has sought, unsuccessfully, since SALT I—in future arms control negotiations with the United States. The Government itself of the Federal Republic of Germany, after announcing willingness to forgo the Pershing IA, suggested that there should be limits on the French shorter-range Pluton missile, scheduled to replace the Hades.

The United Kingdom and France are strong supporters of the narrow interpretation of the ABM Treaty. So is the Federal Republic of Germany. Moreover, all three countries have strong reservations concerning early deployment of SDI. In practice, the differences between these three countries towards strategic defences concerns their attitude towards technological co-operation with the United States on the SDI programme. The United Kingdom and the Federal Republic of Germany have signed participation agreements with the United States on SDI. France has consistently refused to enter into a formal government-to-government agreement, but does allow French companies to participate in SDI-sponsored research. The French alternative to SDI is the European civilian high technology research and development programme, Eureka, in which President Mitterrand has staked considerable personal prestige. The United States has, however, made it clear that it does not consider participation in Eureka incompatible with SDI, much to the relief of the Germans, who at one point feared that they would have to choose between the two programmes. The United Kingdom and the Federal Republic of Germany participate in both Eureka and SDI.

It would be a mistake to over-emphasise the role of the Utopian element in the United States current preoccupation with strategic defence in forming European attitudes towards SDI and the ABM Treaty. Despite the bizarre encounter at Reykjavik, Europeans know that their security will be assured with nuclear weapons for the foreseeable future. But, they would like to see fewer of them around. Thus, much of the impatience with the Administration's strategic arms control policy springs from the fact that, if realised, 50 per cent reductions in nuclear arsenals would be an event of historical dimensions. To hold such an agreement hostage to a programme which may be technically unfeasible and could have negative stability effects appears highly questionable to many Europeans.

Chemical Weapons

For several years, and particularly since 1984, negotiations towards a global ban on chemical weapons have been ongoing at the Geneva Conference on Disarmament. France, Iraq, the United States, and the Soviet Union are the only countries whose possession of chemical weapons is confirmed, but at least 11 other States are believed to possess them, and this list may be growing.

The members of the Conference on Disamament are in broad agreement on prohibiting the possession of chemical weapons, on destroying existing stocks and production facilities over 10 years and on verifying prohibited as well as permitted activities for peaceful purposes, including some form of on-site inspection. Most recently, on 6 August, the Soviet Union agreed to mandatory on-site inspection without a right of refusal, a condition long sought by the United States.

However, many observers believe that conclusion of a global convention remains a distant prospect. Even with stringent on-site inspection, possibilities for clandestine production would persist. Moreover, France proposed on 19 February 1987 that States be permitted to retain a militarily significant capability until the final two years of the destruction process—a proposal which other NATO allies have criticised as potentially encouraging proliferation. Some feel that efforts would be more worthwhile if directed towards export controls on chemical agents, along the lines of the nuclear suppliers' group.

Although NATO Governments support a global chemical weapons ban, another approach, advocated by the West German Social Democratic Party (SPD) as well as Greece, involves regional solutions. The SPD has undertaken unprecedented, and some would argue disturbing, negotiations with the Communist Parties of Czechoslovakia and the German Democratic Republic on a chemical- (and nuclear-) free zone in these three countries, eventually expanded to cover other European countries. Greece has pursued similar negotiations with Bulgaria and Romania for a Balkan zone. The Norwegian Labour Government has taken a supportive but reserved approach to a Nordic nuclear free zone, stressing its relationship to a broader European nuclear-arms control arrangement.

Apart from Greece, NATO Governments do not favour regional solutions. Such efforts, the argument goes, would detract from the Conference on Disarmament. Weapons could always be reintroduced into or fired upon the zone, and the Warsaw Treaty would have a geographical advantage over the United States in returning chemical weapons. Verification would also prove extremely complex because the weapons would not be destroyed but only relocated. More generally, the concept of chemical- and nuclear free zones is fundamentally at odds with the nature of the NATO alliance, involving as it does equal risk-sharing in exchange for equal security.

However, some observers believe that the peculiarities of the chemical-weapon issue within NATO may favour zonal solutions. Given the widespread antipathy towards chemical weapons within NATO—which has pledged, as it has not done in the case of nuclear weapons, never to use chemical weapons first—United States plans for modernising obsolescent stocks in the Federal Republic of Germany have encountered fierce opposition both in Europe and in Congress. Consequently, President Reagan and Chancellor Kohl agreed in 1987 that current United States stocks would be withdrawn from the Federal Republic of Germany by 1992; binary munitions would be stored in the United States but would be available for use in Europe, subject to allied consultation, in a crisis or actual conflict. Given the likely political controversy that would surround a decision on reintroduction, in effect the new arrangements will create a chemical weapon free zone in the Federal Republic of Germany in any event.

Therefore, as Jonathan Dean has argued, NATO should get something in return from the Warsaw Treaty. A regional solution, he believes, would provide a stimulus to the Conference on Disarmament and an opportunity to test verification procedures. From the standpoint of crisis stability, "if a sudden conflict were to start in Central Europe and short-range weapons were not at hand, they could not be used at the outset of that conflict. This is better than the present situation. On a common sense basis, it is also decidedly better than a situation in which only the Soviet Union has stocks in the area."

Conventional Stability

A confluence of events has brought conventional forces closer to the centre of arms control attention in recent years. United States and Soviet proposals for deep reductions in strategic weapons and the double-zero controversy have, as noted, liberated anxieties about the effect of diminished reliance on nuclear weapons. As a consequence, NATO's conventional force disadvantages have been highlighted. As Lord Carrington, NATO's Secretary-General, has remarked: "To remove the nuclear weapons from the equation without doing anything about the current imbalance in conventional and chemical weapons could serve to encourage aggression and thus make war more, rather than less, likely." Coupled with demographic trends in Europe that suggest a declining pool of available manpower over the next several years, apparent Warsaw Treaty concern about new NATO doctrine and technologies for conventional defence, and NATO European concerns, warranted or not, that United States troops in Europe will decrease in number in view of global United States responsibilities, conventional arms control has taken on a new importance.

NATO and the Warsaw Treaty have, of course, been engaged in the MBFR negotiations since 1973. Important principles have been agreed upon, such as collectivity and equal ceilings. But, the talks have been stalemated for years over the issues of a data base (the Eastern and Western estimates for Warsaw Treaty forces differ by 230,000 troops), appropriate verification measures, and the inclusion of armaments (which NATO opposes). More significantly, even if NATO's proposal, calling for a 900,000 troop common ceiling in Central Europe following initial reductions of 5,000 United States and 11,500 Soviet troops were accepted in its entirety, most military observers believe that the effect would be militarily insignificant because the main sources of potential instability—main combat weapons—are not addressed (although NATO could propose such reductions after a troop accord), and because the territory of the Soviet Union is not included. In the central region, the Warsaw Treaty outnumbers NATO by 995,000 to 796,000 in active ground forces, 18,000 to 12,700 in main battle tanks, 9,500 to 3,600 in artillery, and 2,044 to 1,277 in land combat aircraft.

The current phase of conventional arms control developments began with a speech on 18 April 1986 in East Berlin by General Secretary Gorbachev, in which he proposed that "agreement be reached on substantial reductions in all the components of the land forces and tactical air forces of the European States and the relevant forces of the USA and Canada deployed in Europe". In response, on 30 May NATO established a high-level task force charged with exploring "bold new steps" towards the "strengthening of stability and security in the whole of Europe", implying something well beyond MBFR. No NATO country was apparently willing to respond to Gorbachev's initiative by simply urging movement at MBFR. France had always viewed MBFR as too limited in scope and undesirable because of its "bloc-to-bloc" approach, in accordance with idiosyncratic Gaullist notions, whereas the Federal Republic of Germany had long been concerned about its status as the only major NATO Power whose territory would be affected by an agreement. It was not, thus, accidental that France and the Federal Republic of Germany constituted the principal driving force behind the creation of the high-level task force.

On 17 February 1987, negotiations between the 23 NATO and Warsaw Treaty countries began in Vienna, rotating among embassies, on a mandate for negotiations on conventional stability. The Warsaw Treaty position was outlined on 11 June 1986 in the Budapest Appeal. It called for reductions of half a million troops on each side along with their armaments, and included reductions in nuclear weapons not covered in other arms control negotiations. It also called for both sides' doctrines to be of a defensive character. The Warsaw Treaty prefers that the negotiations be held in the 35-State CDE, but has indicated flexibility on this score.

NATO's task force, as of this writing, has still not developed a proposal despite its being charged with developing "bold new steps". On 11 December 1986, NATO announced an approach in the Brussels Declaration. This statement called for two sets of negotiations: the first to continue the work of the Stockholm Conference on Confidence- and Security-building Measures (CSBMs), and the second "to eliminate existing disparities, from the Atlantic to the Urals, and establish conventional stability at lower levels, between the countries whose forces bear most immediately upon the essential security relationship in Europe, namely, those belonging to the Alliance and the Warsaw Pact". The reason for the two sets of negotiations was to avoid giving the neutral and non-aligned countries a direct say in negotiations concerning only the two alliances and to avoid having the talks affected by CSCE deadlines and other procedural rules.

The French, however, preferred that there be some link to CSCE for political reasons (to avoid a strictly bloc-to-bloc approach, to link arms control to other CSCE aspects, and, cynics argue, to so complicate the talks that results would assuredly never emerge, particularly potentially destabilising United States troop withdrawals). Thus, half a year later, at the June NATO meeting in Reykjavik, it was announced that the conventional stability negotiations would take place "within the framework of the CSCE", but would retain autonomy as regards subject-matter, participation and procedure.

With this procedural question temporarily solved, on 27 July NATO tabled a draft mandate in Vienna. According to the United States Ambassador to the Vienna negotiations, Stephen J. Ledogar: "The new negotiations should eliminate disparities in forces that are prejudicial to stability and security, and should—as a matter of high priority—seek to eliminate the capability for launching surprise attack and for initiating large-scale offensive action." Although the mandate was not made publicly available, reportedly the negotiating approach places emphasis on tanks, helicopters and artillery and calls for limitations as well as reductions to common ceilings, subject to on-site inspection. It defers consideration of aircraft and excludes on-site inspections of naval, chemical and nuclear forces.

Responding to the NATO mandate, Soviet Foreign Ministry spokesman Gennadi Gerasimov stated that "serious drawbacks" were evident: no commitment to NATO reductions, exclusion of aircraft and nuclear weapons, and the non-participation of the neutral and non-aligned countries. He noted, nevertheless, a convergence of view regarding the objective of emphasising defensive force postures.

Although broadening the scope of the negotiations from Central Europe to the whole of Europe may make more military sense, in terms of taking into account reinforcements and covering other areas of potential confrontation besides the central region, it is by no means evident that the new negotiations, should a mandate for them be mutually agreed, will prove any more successful than MBFR. It is encouraging that in Prague on 10 April Mr. Gorbachev acknowledged that certain asymmetries did exist, in contrast to prior Eastern claims that approximate parity characterised the military balance. Nevertheless, NATO speaks of eliminating disparities, whereas the Warsaw Treaty proposes equal reductions on both sides. On a pan-European scale, NATO has 2.4 million ground troops versus 2.3 million for the Warsaw Treaty. But, the conventional weapons advantage still favours the East: 52,200 to 22,200 in tanks, 37,000 to 11,100 in artillery, and 7,524 to 3,292 in aircraft. Although it is right to place greater emphasis on conventional arms control, it would be unrealistic to expect rapid results, if any. As Robert W. Komer, former United States Undersecretary of Defense for Policy and a NATO defence expert, has concluded: "Moscow may have looked carefully at the strategic balance and seriously concluded that its conventional military superiority in Eurasia would be far more usable in a non-nuclear world. It may equally have concluded that the democratic West would not pay the price to achieve comparable conventional capabilities. The hell of it is that Moscow would be right on both counts." Regarding CSBMs, the NATO mandate tabled on 10 July is not very informative. It simply states that the participating CSCE States should build upon and expand the results achieved in Stockholm, but mentions no measures and urges that the verification regime for these unknown measures go beyond the Stockholm Document in terms of inspection and information exchange. The Warsaw Treaty, conversely, is likely to propose ambitious constraining measures as well as introduce naval CSBMs. It may also seek to apply CSBMs to North American territory. Almost certainly, the relatively short duration of the Stockholm Conference (1984-1986) is unlikely to be repeated in the next CDE phase.

Short-Range Nuclear Forces

Finally, the NATO Reykjavik communique addressed nuclear forces of under a 500-kilometre range, so-called tactical or short-range nuclear weapons. The Soviet Union had proposed taking up these systems at the negotiations referred in the previous section, to be discussed in tandem with conventional forces. The Kohl Government also favoured negotiations on their reduction, albeit not elimination, given that short-range forces would primarily impact on German territory. The balance in such forces, including France, stands at 88 NATO Lance and 44 Pluton missile launchers and 1,317 artillery pieces, versus 775 Soviet SS-21 and FROG launchers and 3,800 artillery pieces. In addition, there are 1,905 NATO F-104, F-4, F-16 and Tornado aircraft and French Mirage IVA, Mirage IIIE, and Jaguar aircraft, and 4,000 Warsaw Treaty Fitter, Fishbed, Fencer, and Flogger aircraft capable of nuclear strikes for battlefield or longer-range missions.

Most NATO allies, however, favoured a British concept raised in the INF context whereby systems of under 500 kilometres would not be subject to negotiation—an arms control "fire-break", as it were. The reasons against including such systems were that their close integration with field units strengthened their deterrent value (that is, they were more likely to be used early) and that verification problems attendant upon short-range systems, many of which are also capable of conventional missions, would likely prove formidable. There was also concern that drawing these forces into arms control negotiations could jeopardize the already uncertain prospects for their modernisation, as decided upon at the 1983 Montebello meeting of the NATO Nuclear Planning Group, with, for example, an extended-range Lance missile and standoff air-launched missiles, as a corollary to the unilateral NATO reduction of 2,400 warheads from Europe. For example, a recent proposal by former French Defence Ministers Pierre Messmer and Charles Hernu to deploy the extremely controversial tactical neutron weapons in the Federal Republic of Germany (perhaps deployed on the Hades ballistic missile in development) was dismissed by Defence Minister Worner as "irrelevant".

As a compromise with the West German position, the NATO communique states that a component of its "coherent and comprehensive concept of arms control and disarmament" should include "tangible and verifiable reductions of American and Soviet land-based nuclear missile systems of shorter-range, leading to equal ceilings". Thus, aircraft, artillery, and third-country systems are excluded. Moreover, these talks should take place only "in conjunction with the establishment of a conventional balance and the global elimination of chemical weapons". Because, as noted, the prospects for both talks are at best uncertain and the establishment of a conventional balance in Europe probably a pipe-dream, negotiations on short-range nuclear forces are in effect indefinitely deferred. However, because concerns abound that such short-range forces would have to be used early to avoid being overrun (even though NATO has factored into its defence planning the capture of substantial nuclear weapons systems), proposals for their reduction or removal from nuclear free zones are likely to persist.

Conclusion

NATO Europe is composed of 14 sovereign nations. They do not necessarily have identical arms control policies. There are logical reasons for this. For example, two of them are nuclear powers. Most European members of the alliance permit the deployment of nuclear weapons on their territories but others do not. One European nation, France, feels strongly that arms control should be linked with broader improvements in East-West relations, for example, with the Soviet Union's performance in human rights. Within individual European countries, there are divergent views on appropriate arms control policies, as witnessed by the West German SPD negotiations with the Eastern Europeans on a nuclear- and chemical-free corridor in Central Europe, a course rejected by the Government in Bonn. Unilateral nuclear disarmament has been advocated by opposition parties in the Federal Republic of Germany and the United Kingdom, and European socialist parties are urging a major rethinking of current strategy towards substantially less reliance on nuclear weapons and a greater readiness to assume that the Soviet Union is prepared to dismantle East-West confrontation, hence the term "common security".

Despite these differences among and within NATO European nations, however, there is a common European attitude towards arms control, even if it does not always manifest itself in identical European arms control policies. With the possible exception of France, NATO European Governments must be perceived by their electorates to be working for arms control agreements. Arms control has come to be seen as an integral part of a security policy. But, beyond general attitudes towards arms control, Reykjavik has had some jelling effect on European views on substantive arms control issues. European Governments, although not socialist parties, want to ensure that nuclear deterrence remains the bedrock of alliance security. In practical terms, this means pursuing 50 per cent (not 100 per cent) reductions in strategic systems; accepting, reluctantly, a zero-zero INF agreement but deferring negotiations on tactical nuclear weapons; and taking conventional arms control negotiations more seriously. At the same time, a major sector of European opinion, according to Ambassador Dean, "has concluded that the East-West confrontation has passed its peak and is in decline, a decline which should be hastened".[21] Coupled with anti-nuclear sentiment among the public and many opposition parties, NATO Governments will continue to face important challenges to prudently balancing arms control and defence policy.

The Reykjavik communique represents a potentially significant beginning on the long road to negotiated force reductions with the Warsaw Treaty. With the exception of INF, however, the prospects for arms control remain uncertain. Mr. Gorbachev has imposed important new directions in Soviet arms control policy, but it would be too much to expect philanthropy. Unlike the INF case, wherein NATO successfully presented serious incentives for negotiation, the other existing and potential forums find NATO either at a disadvantage (conventional, chemical and short-range nuclear) or in the midst of a doctrinal debate not necessarily susceptible to compromise with the USSR (SDI). Strengthening incentives for genuine negotiations, however, remains politically controversial. It is, consequently, ironically disconcerting that in an era where the Soviet Union may indeed be willing to undertake substantial and verifiable reductions, differences on defence and arms control policy in the West may retard concerted NATO initiative. Hence, better management of West-West relations will prove equally important as East-West relations if, in the future, arms control is to succeed.

ANNEX

Resolution 194 on The Arms Control Challenge for the Alliance*

The Assembly,

Convinced that balanced and effectively verifiable arms control agreements are a fundamental component of Western security;

Conscious that public support for the Alliance is essential to maintain the validity of NATO's deterrent strategy, and convinced that reductions in numbers of nuclear weapons contribute to an improvement in public support for this strategy;

Welcoming the statement at the Ministerial Meeting of the North Atlantic Council at Reykjavik on 12 June 1987;

* Presented directly to the Plenary North Atlantic Assembly at the request of the President by Mr. John Cartwright (Social Democrat, United Kingdom), amended and adopted, 25 September 1987, Oslo, Norway.

Welcoming the US-Soviet joint statement of 18 September announcing agreement in principle on the conclusion of a treaty on intermediate range forces, to intensify efforts to achieve a treaty on 50% reductions in strategic offensive arms, and to begin full-scale stage-by-stage negotiations on nuclear testing;

Encouraged by the conclusion on 15 September 1987 of the agreement on US-Soviet nuclear risk reduction centres;

Noting developments in the Conference on Disarmament regarding verification of a comprehensive global ban on chemical weapons;

Concerned that the absence of a predictable environment surrounding strategic offensive nuclear weapons and defense and space arms jeopardizes prospects for strengthening strategic stability;

Aware that such a predictable strategic environment implies a strengthening of the 1972 Anti-Ballistic Missile Treaty regime;

Stressing the important and complementary role of conventional arms control negotiations in maintaining deterrence against all forms of aggression;

Aware of the need to improve the harmonisation of NATO's force planning and arms control policies;

Expressing its conviction that, for East-West stability to be genuinely strengthened, professed non-offensive Warsaw Pact intent must be tangibly demonstrated by appropriate restructuring of its offensively oriented force posture;

Urges the United States and the Soviet Union:

1. to move speedily to overcome the remaining obstacles and conclude an agreement banning their land-based intermediate-range nuclear missiles on the basis of equality of rights and limits;
2. to convene, at the earliest possible opportunity, the Anti-Ballistic Missile (ABM) Treaty review conference in an attempt to achieve mutual understandings on those articles of the ABM Treaty which are ambiguous and open to subjective interpretation, particularly those defining "research", "development and testing", "components", and "other physical principles", in the expectation that such mutual understandings will provide a foundation for an early agreement on deep reductions in strategic offensive nuclear arms to balanced and stable levels;
3. to continue efforts to build upon the 1974 Threshold Test Ban Treaty and the 1976 Peaceful Nuclear Explosions Treaty by

limiting the yield and frequency of their nuclear tests, as a step toward the ultimate objective of achieving a comprehensive nuclear test ban treaty; and

4. to resume negotiations on confidence-building measures applicable to their nuclear forces with a view to achieving more effective measures, including those providing for the advance notification of all ballistic missile launches and major military exercises, to reduce the risks of surprise attack and confrontation triggered by miscalculation, accident, or failure of communication;

Urges member governments of the North Atlantic Alliance:

(a) to continue to exercise their best efforts with a view to achieving an early agreement on a comprehensive, global ban on chemical weapons;

(b) to explore, as part of a comprehensive approach to arms control and disarmament, appropriate limitations, consistent with NATO's 1983 Montebello decision, on those US and Soviet nuclear weapons in Europe of under 500 kilometres range, which may pose special problems for crisis stability;

(c) to commence, without delay, negotiations on conventional stability from the Atlantic to the Urals between NATO and the Warsaw Pact within the framework of the Conference on Security and Co-operation in Europe, aimed at establishing a stable, secure, and effectively verifiable balance of conventional forces at lower levels, removing disparities, and eliminating the capability for launching surprise attacks and for initiating large-scale offensive action, with primary emphasis placed on stability measures applicable to main ground combat weapons in the Central Region; and

(d) to negotiate and adopt, in the next phase of the Conference on Confidence-and Security-Building Measures and Disarmament in Europe, mutually complementary and effectively verifiable confidence- and security-building measures to further reduce the risks of military confrontation in Europe, with special attention devoted to operational constraints on military activities, exchange of views among commanders, greater information exchange about military forces, and enhanced co-operative means and modalities of verification, including mandatory on-site inspection.

IMPLICATIONS OF THE INF AGREEMENT

A rare and unanimous spirit of international approval attended the signing of the Treaty on the Elimination of Medium- and Shorter-Range Missiles at the December 1987 summit meeting between General Secretary Mikhail Gorbachev and President Ronald Reagan in Washington, D.C. It is perfectly justified to call this a historic event. The Treaty marks a distinct improvement in the relations between the USSR and the United States as well as in the international situation as a whole. It goes beyond former agreements on a partial limitation of nuclear weapons because, for the first time, it provides for a reduction of stocks. To rid the world of the most dangerous weapons of mass destruction has become a topical task of practical politics. Ratification and implementation is now the demand in order to actually implement the beginning of nuclear disarmament. At the same time, it is necessary to refrain from all efforts designed to compensate for the reduction of arsenals by an intensified armament in other fields. Rather, the Treaty should be a signal for the cessation of the arms race in all areas.

During the last stage of the negotiations, heads of Governments and politicians of differing political views, as well as members of peace movements, expressed their hope that an agreement on intermediate-range nuclear weapons would give impetus to the disarmament process in all categories and at all levels. Now that the Treaty has been signed, those expectations are even more distinctly articulated. For this reason, it appears worthwhile to examine the question of how one should or could proceed after the conclusion of the Treaty. The following general aspects should be taken into account.

First, the agreement can only be considered in the context of other developments and not isolated from them, in terms of both time and political interrelationships. Great efforts were already being made to set the course for further steps to reduce and eliminate nuclear weapons, parallel to the efforts being made to complete the agreement.This is also reflected in the Joint Statement of the Washington summit of December.

Secondly, the Treaty is a first step, the beginning of what will be a difficult process. There is no automatic relationship between this agreement and further concrete moves on disarmament. Visions associated with the conclusion of the accord can only come true through vigorous action by the two sides and, indeed, by all States. Many obstacles still need to be overcome to free the world of weapons of mass destruction and to create a truly secure peace through disarmament.

Thirdly, it will be impossible to describe in great detail the complex consequences of the agreement, ranging from the military aspects to those in the political sphere. Therefore our following observations will be confined to the field of arms limitation and disarmament, making a distinction between direct and indirect effects.

The Treaty is the outcome of a serious attempt on the part of the USSR and the United States to accommodate each other's interests. Both sides deserve credit for it. They had always been able to count on broad international support. General Secretary Gorbachev called the agreement the result of joint efforts by all peoples and a special contribution made by the respective allies in their search for solutions. A number of States, including the German Democratic Republic, have also undertaken special obligations with regard to the implementation of the INF Treaty.

The materialisation and the impact of that agreement go beyond the bilateral framework of its conclusion. Therefore, it is more than ever necessary to see the interrelationship between bilateral regional and global efforts and to develop appropriate fora which are apt to promote reciprocal stimulation. There is a real chance now to set in motion the disarmament process on a large scale; that chance should be seized.

The first point in an evaluation of the agreement is that, with its implementation, Soviet and American land-based nuclear missiles in the 500-5,500 kilometre range will be eliminated. Given the size of the stockpiles, this will certainly affect only a small fraction of the total number of nuclear weapons. We should, however, also take account of the qualitative aspect. The accord concerns sophisticated weapons systems and does not mean the scrapping of any outdated potentials. It is the longer-range intermediate nuclear forces which must be seen as dangerous and destabilising, on account of the extremely short warning time they allow and their high accuracy in the context of various doctrines for their use, such as a "nuclear first strike", a "decapitation strike" and "limited nuclear war". Consequently, the elimination of these weapons means that the capability of nuclear attack will be reduced to a certain extent and that favourable conditions will be created for pursuing efforts towards a greater measure of security, especially in Europe and Asia.

A further aspect is confidence-building. The conclusion of the agreement is tangible evidence of the capability to scale down military confrontation and to diminish the danger of a nuclear war in the interest of both sides and for the benefit of all mankind, despite the continued existence of fundamental political and ideological differences. Confidence is a synonym for reliability, for correspondence between words and deeds. The conclusion of the agreement is a convincing example of the translation of basic declarations of intent (made at the summit meetings in Geneva, Reykjavik and Washington on the prevention of a nuclear war and the elimination of nuclear weapons) into binding obligations under international law.

The general confidence-building effect is corroborated by the provisions of the accord concerning verification. In this respect new ground will be broken too, for it will be the first time that international verification will be applied to the obligation to abolish two categories of nuclear weapons and to guarantee, at the same time, that they will not be produced and deployed again. The solutions found—just like other parts of the Treaty—are of great practical importance for the drafting of other bilateral, regional and global disarmament accords. One can even go a step further: the conclusion of the Treaty surely means that a clean break has been made with the decades-old basic conflict over the verification of disarmament agreements. The verification issue has now finally lost its function as a political and ideological instrument for stirring up confrontation and preventing disarmament measures; rather, it is gaining the importance it deserves in businesslike negotiations as an element of constructive co-operation.

Finally, one can hope that conclusion of the agreement will have a positive impact on efforts to prevent the horizontal proliferation of nuclear weapons. It is in conformity with the obligation of the Soviet Union and the United States, enshrined in article VI of the non-proliferation Treaty (NPT), to conduct in good faith negotiations on effective measures to end the nuclear-arms race and to proceed to nuclear disarmament. The increase of the NPT's international authority resulting therefrom can surely be expected to be conducive to the desired and urgently needed universality of that important Treaty.

When considering other tangible results in the negotiations leading to the Treaty and exploring new areas for agreements, one must ask about the objectives and concepts of States and the degree of international consensus on the next steps.

With their comprehensive programme of peace, the Warsaw Treaty States have submitted principles, methods and proposals for consideration. While the programme spells out a task reaching far into the future, i.e. the establishment of a comprehensive system of international peace and security, it specifies clear-cut goals in the fields of disarmament, arms limitation and confidence-building. The centrepiece of this programme is the phased elimination of nuclear weapons and other weapons of mass destruction by the year 2000—a proposal made by the Soviet Union. The priorities established by the programme for the next stage are the following: 50-per cent reductions in the offensive strategic weapons of the USSR and the United States, coupled with the strengthening of the ABM Treaty regime; discontinuation of all nuclear weapon tests; radical reductions in conventional armaments in Europe and elimination of tactical nuclear weapons; total prohibition of chemical weapons on a world-wide scale; and prevention of an arms race in outer space.

These lines of action are supported by detailed proposals at all levels of negotiation and are accompanied by numerous initiatives which concern the whole spectrum of questions, such as ending the arms race, easing military and political tensions, reducing the risk of nuclear war, and confidence-building in all its forms.

The approach of the non-aligned countries, as demonstrated at their summit at Harare, is in general similar, and it involves a number of proposals that are identical. Also, the final communique of the last NATO Council session, held in Reykjavik in June 1987, offers points of departure in the search for accords going beyond the agreement on the elimination of intermediate-range forces. One cannot, however, overlook the fact that the doctrine of deterrence, which was reaffirmed on that occasion and which includes the option of the first use of nuclear weapons, is increasingly proving to be a major barrier to radical measures to eliminate all nuclear weapons.

I would now like to turn to views about further steps in disarmament that have been expressed in various quarters.

1. The Joint Soviet-United States Statement of December 1987 coupled the agreement on the double-zero solution with the intention to expedite the elaboration of an accord on a 50-per cent reduction in offensive strategic weapons in the bilateral negotiations at Geneva. It refers to the objective of achieving this aim as early as the first half of 1988. Respect for the principle of mutual security, the renunciation of any attempt to gain unilateral military advantages in the negotiating process, as well as agreement to maintain the ABM Treaty are all prerequisites for success. Drastic cuts in offensive strategic

weapons, beyond the Treaty on intermediate-range weapons, would bring about a new situation in qualitative terms. It would constitute a real breakthrough on the way to a peaceful world without nuclear weapons. So, if one questions what will follow the INF Treaty, one should think of this as the primary task.

2. The possibility of reducing nuclear arsenals draws one's attention to the demand, made by a great majority of States, for an end to nuclear weapon testing. Therefore it is noteworthy that the two sides have started negotiations on this subject. There is hope that they will contribute to a cessation of nuclear weapon tests everywhere. The Soviet moratorium, which lasted for many months, demonstrated that it is possible to achieve a comprehensive ban on nuclear weapon tests within a relatively short span of time—if necessary, via intermediate measures. The grounds for a ban are compelling. It is becoming more of a practical necessity to combine steps to reduce nuclear weapons with supporting measures against the continuing arms race. The discontinuation of all nuclear weapon tests would be a means to this end, since it would practically prevent the improvement of nuclear weapons and be a strong incentive for stopping their development and production. The elimination of two categories of nuclear weapons would also be a convincing cause for agreeing on an interim solution providing for a drastic reduction in the yield and the number of test explosions. We will be going into the global aspect of this question later on. What remains to be noted here is that bilateral arrangements along these lines between the USSR and the United States could considerably encourage the necessary global solution. Conversely, progress in the multilateral process would have a favourable bearing on bilateral efforts.

3. The tactical nuclear weapons emplaced in Europe and possible cutbacks in conventional armaments have played a crucial role in discussions on the INF agreement. Hence one is justified in hoping that recent developments will generate positive effects on the ongoing endeavours within the framework of the process known as the Conference on Security and Co-operation in Europe (CSCE). The socialist countries have been pressing for an early decision on a mandate for a conference on these matters, and they have already submitted substantive proposals, formulated at their meetings in Berlin and Budapest.

The INF agreement can be expected to have a stimulating effect on efforts towards special regional measures to combat the arms race. This is true for all parts of the world, but in particular for Europe, where the largest arsenals of all types of weapons have been accumulated. The German Democratic Republic believes that security would be remarkably enhanced in terms of diminished offensive capabilities if nuclear- and chemical-weapon free areas were established along the sensitive divide between the two military alliances. The German Democratic Republic and Czechoslovakia have proposed creating a nuclear weapon free corridor of 150 kilometres on either side of the boundary with the Federal Republic of Germany in which neither nuclear nor dual-capable weapons systems would be stationed. This measure, which could be carried out rather quickly, would have an immediate security- and confidence-building effect and give fresh impetus to the general drive to rid the globe of all nuclear weapons.

Every success in the bilateral disarmament negotiations between the USSR and the United States necessarily spotlights the role and effectiveness of multilateral arms limitation and disarmament efforts, which focused on reaching global solutions. It is evident that all States and peoples have a common interest in seeing international peace and security strengthened through arms limitation and disarmament. Their right and duty to co-operate to this end is generally recognised. To use to the full the great policy potential of multilateral mechanisms is not just an imperative of international democracy, but also an increasingly urgent matter if practical results in the disarmament process are to be achieved. The effectiveness of multilateral disarmament forums, particularly the United Nations and the Conference on Disarmament, is highly disproportionate to what the situation requires.

The Treaty on intermediate-range nuclear forces should help to bring about a radical change here, all the more so as the mere prospect of successful conclusion of the accord had favourable repercussions on the climate of the Geneva-based Conference. The forthcoming third special session on disarmament should also give the multilateral process a strong impetus. The paramount importance of bilateral negotiations and agreements between the Soviet Union and the United States is uncontested. Yet, they are supposed to lead to world-wide accords, and they would already have a greater impact if parallel measures were being taken on a global scale. Therefore, the call for a co-ordinated approach between multilateral and bilateral forums is being increasingly heard. The following examples testify to the fact that this is both necessary and possible.

1. On the basis of the progress achieved by the Soviet Union and the United States on the reduction of nuclear weapons, the Conference on Disarmament should be in a very good position to elaborate a programme of nuclear disarmament—bearing in mind regional efforts—which would be endorsed by all States. In outlining a phased approach, the programme could also take due account of tasks for the other nuclear weapon States and the ever closer relationship between nuclear and conventional disarmament. The Geneva Conference is the appropriate organ, since not only all nuclear States, but also other militarily important States, are represented in it.

2. The cessation of all nuclear weapon tests has for a long time been an item on the Conference's agenda. Important reasons for resolving this issue urgently have already been indicated. We should add that a global solution is indispensable because it is a question of establishing obligations not only for the nuclear weapon States, but also for the non-nuclear weapon States. The objective interrelationship between bilateral and multilateral negotiations is particularly evident in this case. In June 1987, in the interest of reaching mutual understanding, the Warsaw Treaty States submitted to the Conference on Disarmament basic provisions for an agreement banning all nuclear weapon tests. Practical work could be started immediately. It should be possible to reach agreement on the order of priorities. Verification might well be the first question to be addressed. On no account is the current standstill in the Conference consistent with recent developments in bilateral efforts.

3. The establishment of an effective parallel between bilateral and multilateral negotiations to prevent an arms race in outer space is becoming more urgent. Whereas the strengthening of the ABM Treaty regime should be assigned primarily to bilateral negotiations, the Conference on Disarmament could make a contribution of its own by agreeing to a basic non-use of force formula. For this purpose the German Democratic Republic and Mongolia have jointly put forward possible basic provisions for an agreement on the prohibition of anti-satellite weapons. In doing so, they have taken into consideration the fact that an increasing number of States have become actively involved in the peaceful exploration and use of outer space.

4. Finally, the INF Treaty will have a stimulating effect on activities of the Conference on Disarmament where there is a clear possibility of mutual understanding. I have in mind the comprehensive ban on chemical weapons. A positive response is expected, in particular from the United States, to the Soviet Union's recent submission of a number

of new proposals. This would also conform with the provision set forth in the Joint Statement of the Washington summit. Conversely, the speedy conclusion of work on the convention would contribute in a fundamental way to the elimination of all kinds of weapons of mass destruction. It may be supposed that the practical experience gained in the elaboration of the INF agreement will be useful in drafting the chemical weapons convention.

In conclusion, let me add a few more general remarks. Progress will have to be made on the conceptual level in finding challenges of the nuclear and space age before the political potential of accords providing for reduction of the arsenals of weapons of mass destruction can be realised. It is to be hoped that a consideration of interests will decrease the militarisation of intergovernmental relations. National security can no longer be ensured with the means and methods of previous centuries. Nor can its substance remain the same any longer. Though it may still seem inconceivable to certain military or political figures, one's own security cannot be guaranteed in the long run without a base of mutuality; more weapons do not spell more security. In the nuclear and space age one must pursue the opposite direction: ensure more peace with ever fewer weapons.

FUTURE PROSPECTS OF THE INF AGREEMENT

The agreement on the complete and global elimination of all United States and Soviet missiles with a range between 500 and 5,500 kilometres signed by President Reagan and General Secretary Gorbachev, in Washington on 8 December 1987 is historic. Its significance extends well beyond the domain of bilateral United States-Soviet relations: it is a milestone in a key area of the East-West relationship where lasting improvements are very much in the interest of the Federal Republic of Germany. It is at the same time a beacon of hope for all who aspire to peace and security with as few weapons as possible. The agreement on intermediate-range nuclear forces (INF) does, in fact, show that it is possible to arrive at balanced and effectively verifiable arms control accords leading to greater stability and security for all concerned.

The following aspects have implications for arms control beyond the framework of the INF agreement itself:

(a) For the first time in the history of arms control negotiations a whole category of weapons is not merely to be limited, but eliminated altogether. Thus, the INF agreement may mark the beginning of genuine disarmament;

(b) Imbalances are to be rectified by means of asymmetrical reductions. The side with the most weapons—in this case the Soviet Union—must reduce more. This principle should also be applied to other areas of disarmament;

(c) The agreement contains verification measures that not long ago would have seemed Utopian. This, too, implies the practical recognition of an arms control principle without which confidence building and disarmament are inconceivable.

The West has from the very outset called for a negotiated solution to the problem of intermediate-range nuclear missiles. When in 1979, the North Atlantic alliance saw itself forced to react to the build-up of state-of-the-art Soviet SS-20 missiles and to the threat they implied for Western Europe and Asia, it did not decide solely on a numerically limited modernisation programme, but coupled it with an offer to revoke the deployment of United States systems if the Soviet Union was prepared to remove its own intermediate-range missiles. With that offer the alliance made clear that its preferred solution was the removal of the Soviet systems and not the deployment of United States intermediate-range missiles in Europe.

This aim, which has been pursued persistently for years, was also reflected in the West's basic posture, which the Government of the Federal Republic of Germany helped to shape: the zero-zero solution, in other words, both sides eliminating their intermediate-range systems.

The Federal Republic Government has played a major part in elaborating the negotiating positions of the alliance, and in this process has made important contributions of its own. The Federal Chancellor's decision of 26 August 1987 to the effect that after the global elimination of all United States and Soviet intermediate-range nuclear missiles, in conformity with the INF agreement, the Federal Republic would give up its Pershing 1-As, made it possible to achieve a breakthrough in the final phase of the negotiations. That decision was appreciated not only by our allies, but also by the Soviet Union.

The Federal Republic Government has good reason to be gratified that the result of the negotiations meets fully the proposal first tabled by the Western alliance in 1981—a rare event following years of difficult negotiations, but one showing that the Western position was well substantiated and balanced. It is now essential that the United States Senate should in the future give its consent to the ratification of the agreement.

This success is an endorsement of the alliance's security policy, which is based on the dual strategy developed in the Harmel report of 1967. On that basis the alliance is committed to seeking co-operative solutions to the problems of security, while maintaining its defence capability. Consequently, arms control and disarmament on the one hand and deterrence and defense on the other are integral parts of our security policy. These two components complement each other and merge in the goal of preventing any kind of war, conventional or nuclear, and enhancing the security of the Federal Republic and that of the alliance. They are the foundation for the efforts of the alliance to develop East-West co-operation through broad-ranging, constructive dialogue, and for its coherent and comprehensive concept of arms control and disarmament, expressed in the statement issued by the NATO foreign ministers after their meeting in Reykjavik on 12 June 58 1987. The INF agreement is a central element of that concept, not only because it constitutes a result in itself but because it should pave the way for progress in other areas of arms control and disarmament. With this in view, in Reykjavik, the foreign ministers defined the following objectives:

(a) A 50 per cent reduction in the strategic offensive nuclear weapons of the United States and the Soviet Union, to be achieved during current Geneva negotiations;

(b) The global elimination of chemical weapons;

(c) The establishment of a stable and secure level of conventional forces, by the elimination of disparities in the whole of Europe;

(d) In conjunction with the establishment of a conventional balance and the global elimination of chemical weapons, tangible and verifiable reductions of American and Soviet land-based nuclear missile systems of shorter range, leading to equal ceilings.

With regard to strategic nuclear weapons, both Super-Powers have declared their intention, before the end of President Reagan's term of office, to conclude an agreement providing for a 50 per cent reduction of their arsenals. Such an agreement is in the interest of the whole family of nations. It will be conducive to the lasting enhancement of strategic stability.

The long years of negotiations on a convention prescribing a global ban on chemical weapons have reached a stage that makes its early conclusion possible. The objective is to give everybody more security. This ghastly category of weapons must not be allowed to exist any longer. In view of the alarming proliferation of chemical weapons, they must be eliminated once and for all.

In the conventional sphere, the Federal Republic Government and its allies are hoping that a mandate will soon emerge in Vienna for negotiations on the establishment of conventional stability throughout Europe. Our aim is a stable level offerees, linked with the removal of imbalances, in which the forces on each side will fulfil defence requirements without being capable of invasion. This already applies to the Western forces.

With regard to short-range nuclear missiles, the Soviet Union has a marked superiority, which is detrimental to stability. In Reykjavik the alliance included these weapons in its arms control concept and stated, as its aim, tangible and verifiable reductions of American and Soviet land-based nuclear missile systems of shorter range, leading to equal ceilings. This broad concept of arms control and disarmament now has to be pursued consistently. The Government of the Federal Republic of Germany will do everything in its power to achieve this objective and will harness for this purpose the impulses emanating from the INF agreement now signed. We want more security and less disparity in all areas of the military relationship. Our geo-strategic position and the fact that the line dividing the two alliances cuts right through Germany necessitate our special commitment to arms control and disarmament.

The progress now being achieved in the field of arms control is a great opportunity for improving the East-West relationship. The course for such improvement has been staked out in 1975 by the Final Act of Helsinki. Preventing war, safeguarding peace, promoting cooperation in all spheres, enhancing respect for human rights, and bringing the people in divided Europe, in divided Germany, closer together through free contact and the free exchange of views—this is the mission of the Final Act by which we are bound.

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NUCLEAR ARMS LIMITATION AND DISARMAMENT

A. Introduction

Since the dawn of the nuclear age almost half a century ago, efforts have been made in the world community to deal with the various implications of the existence of nuclear weapons. Many of them have been concerned with a wide range of specific measures aimed at the limitation, reduction and elimination of nuclear weapons and their delivery systems. Some others dealt with the prevention of the proliferation of nuclear weapons, cessation of nuclear weapon tests, and the establishment of nuclear weapon free zones in various regions of the world. Some discussions focused also on the legal rules regarding possession and possible use of nuclear weapons.

Arms limitation and disarmament efforts have been pursued both within and outside the United Nations framework. The United States and the Soviet Union have considered a number of measures bilaterally, particularly those dealing with the limitations of their strategic arms and the elimination of their intermediate/medium-range nuclear missiles (INF). Many other efforts were undertaken in the regional as well as global context. Over the years, a number of agreements have been reached dealing with various aspects of nuclear weapons.

B. Constraints on the Possession of Nuclear Weapons

Two different approaches developed with respect to imposing constraints on the acquisition of nuclear weapons. Both of them deal with the acquisition of nuclear weapons by non-nuclear weapon States. One approach involved negotiations for a global treaty committing nuclear weapon States not to transfer nuclear weapons and non-nuclear weapon States not to acquire them. The other approach concerned the establishment of nuclear weapon free zones in various regions of the world. Although based on the same principle of non-acquisition of nuclear weapons, the latter approach encompasses additional constraints, both on nuclear and non-nuclear States parties to such zones and is, as such, broader in scope.

1. Treaty on the Non-Proliferation of Nuclear Weapons

The Non-Proliferation Treaty (resolution 2373 (XXII), annex) is regarded by many as an important achievement in the area of nuclear-arms regulation. The Treaty was opened for signature on 1 July 1968 and entered into force on 5 March 1970. Among the nuclear weapon States, the Soviet Union, the United Kingdom and the United States are parties to the Treaty and serve as its depositaries. China and France, while not parties to the Treaty, have on various occasions stated that they do not support nuclear proliferation and would not act contrary to the Treaty's provisions. By the end of June 1990 the Treaty had 141 parties, making it the most widely accepted arms limitation instrument. A considerable number of non-nuclear weapon States advanced in nuclear technology have become parties to the Treaty. On the other hand, some such States have not yet become party to it.

The basic provisions of the Treaty are to: prevent the spread of nuclear weapons (Arts. I and II); provide assurance, through international safeguards, that the peaceful nuclear activities of non-nuclear weapon States will not be diverted to making such weapons (Art. Ill); facilitate, to the maximum extent consistent with the other purposes of the Treaty, the peaceful uses of nuclear energy through full co-operation—with the potential benefits of any peaceful application of nuclear explosion technology being made available to non-nuclear parties under appropriate international observation (Arts. IV and V); express the determination to pursue negotiations in good faith on effective measures relating to cessation of the nuclear-arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control (Art. VI). The NPT also has considerable relevance to several other arms control and disarmament measures, e.g. a comprehensive nuclear-test ban, negative security assurances and nuclear weapon free zones.

The Treaty also contains provisions for periodic review of its operation (Art. VIII). It also states that a conference shall be convened 25 years following the entry into force (i.e. in 1995) "to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods" (Art. X).

Three review conferences have been held so far: in 1975, 1980 and 1985. The Fourth Review Conference is scheduled to take place in August/September 1990. China and France have indicated their intention to attend as observers.

At the time of the Third Review Conference there were 131 parties to the Treaty. The strong convergence of interests of the nuclear and non-nuclear weapon States parties to check the further spread of nuclear weapons provided a basis for the successful conclusion of the Conference with the adoption by consensus of a Final Document. This document, although critical of the implementation of the Treaty in some areas and recommending further strengthening of the international system for non-proliferation in others, confirmed unanimously the sustained validity of the fundamental aims of the Treaty and concluded that it continues to meet its basic objective.

2. *Nuclear Weapon Free Zones*

The idea of establishing nuclear weapon free zones as a means of keeping the regions concerned free of nuclear weapons began to attract the attention of the international community in the 1950s. Many proposals have been made since that time. While some of them are still being considered in various forums, agreement has been reached on two of them.

(a) Treaty of Rarotonga

The South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga) was opened for signature on 6 August 1985 and entered into force on 11 December 1986. Eleven out of 15 members of the South Pacific Forum had become parties to the Treaty as at June 1990. The four countries that have not signed the Treaty are: Tonga, Vanuatu the Federated States of Micronesia and the Republic of the Marshall Islands. The Treaty area encompasses large sea areas, but most provisions apply only on land and, consequently, nothing in the Treaty affects the exercise of the rights of any State under international law with regard to freedom of the saas.

The Treaty of Rarotonga creates a “nuclear free”, rather than a “nuclear weapon free”, zone. The prime intention of the Treaty was to keep the region free of the stationing of nuclear weapons, nuclear testing and environmental pollution by radioactive waste. Moreover, the parties wished to prohibit all types of nuclear explosions. Accordingly, the operative articles of the Treaty refer consistently to “nuclear explosive devices”, a term which covers all nuclear devices, irrespective of the purpose, military or peaceful, which has been given for their existence.

Each party to the Treaty undertakes not to manufacture, acquire, possess or have control over any nuclear explosive device inside or outside the zone. Moreover, it undertakes to conduct any nuclear co-operation with other States in accordance with strict non-proliferation measures to provide assurance of exclusively peaceful non-explosive use, and to support the effectiveness of the international non-proliferation system based on the Non-Proliferation Treaty and the safeguards system of IAEA. While exercising its sovereign rights to decide for itself whether to allow foreign ships (which may be nuclear-powered or nuclear-armed) to visit its ports or foreign aircraft to visit its airfields or fly over its territory, each party undertakes to prevent any nuclear explosive device from being stationed in its territory. It also undertakes to prevent all testing of such devices on its territory and not to assist others in doing so. It further undertakes not to dump radioactive wastes anywhere at sea within the zone and to prevent such dumping or storing by anyone in its territorial sea.

The States outside the zone that have jurisdiction over territories within it (France, the United Kingdom and the United States) would, upon becoming parties to Protocol 1, apply the Treaty's key provisions to those territories. The five nuclear weapon States would, upon becoming parties to Protocol 2, undertake not to use or threaten to use nuclear explosive devices against parties to the Treaty, and any such State would?" upon becoming party to Protocol 3, refrain from nuclear testing within the zone.

The Soviet Union and China have ratified Protocols 2 and 3. France, the United Kingdom and the United States have indicated that they do not intend at this time to become parties to any of the Protocols. However, the United States declared that none of its practices and activities within the Treaty area were inconsistent with the Treaty and its Protocols, while the United Kingdom stated that it would respect the intentions of States of the region on Protocols 1 and 3.

South Pacific nations have expressed disappointment that France has not signed the Protocol 3 and continues to test within the zone. France put forward its position on this matter to the General Assembly on 2 June 1988.

(b) Treaty of Tlatelolco

The Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco) was the first treaty to establish a nuclear weapon free zone in a densely populated area. It was also the first agreement to establish a system of international control and a permanent supervisory organ, the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL).

The Treaty was signed on 14 February 1967, at Tlatelolco, a borough of Mexico City. The basic obligation of the parties to the Treaty, defined in article 1, is to use exclusively for peaceful purposes the nuclear material and facilities under their jurisdiction, and to prohibit and prevent in their respective territories the very presence of nuclear weapons for any purpose and under any circumstances. Parties to the Treaty also undertake to refrain from engaging in, encouraging or authorising, directly or indirectly, or in any way participating in the testing, use, manufacture, production, possession or control of any nuclear weapons.

Annexed to the Treaty are two Additional Protocols, which create a system of obligations for extra-continental and continental States having responsibility de jure or de facto for territories in the zone of application of the Treaty as well as obligations for the nuclear weapon States. Thus, under Additional Protocol I, France, the Netherlands, the United Kingdom and the United States would agree to guarantee nuclear weapon free status to those territories for which they are, de jure or de facto, internationally responsible. The Protocol has been signed and ratified by the Netherlands, the United Kingdom and the United States. France has signed it and has declared that it will in due course take an appropriate decision, considering that not all States concerned in the zone are yet parties to this Treaty. Under Additional Protocol II, nuclear weapon States pledge to respect fully the “denuclearisation of Latin America in respect of warlike purposes” and “not to use or threaten to use nuclear weapons against the Contracting Parties”. By 1979, all five nuclear weapon States had adhered to it, and in that connection made individual declarations with respect to various provisions of the Treaty and its Protocols.

As at June 1990, the Treaty was in force for 23 Latin American States that had ratified it and had waived the requirements for entering into force set out in article 28 (that all States in the zone be parties to the Treaty, that all States to which the Protocols apply adhere to them and that relevant safeguards agreements be concluded with IAEA). Several States within the denuclearised zone are not yet parties to the Treaty, among them Cuba, which has not signed the Treaty. Argentina has signed but has not ratified it, and Brazil and Chile have ratified it but not waived the requirements for its entry into force. Argentina, as a signatory, has officially declared that it would not act against the objectives of the Treaty.

(c) Various Proposals

The discussion of the question of establishing nuclear weapon free zones in various parts of the world is continuing between regional States concerned and within the United Nations disarmament bodies. While supporting the concept as such, many member states stress the importance of certain prerequisites for the successful implementation of the concept of nuclear weapon free zones. Among the principles and objectives most referred to are the following: the initiative should come from the States in the region concerned and the arrangements to establish a nuclear weapon free zone should be based on agreement freely arrived at among the States of the prospective zone; the arrangements should take into account the specific characteristics of the region in question; such arrangements should contain provisions concerning verification of the commitments undertaken; the nuclear weapon States should undertake obligations to respect the status of the denuclearised zone and not to use or threaten to use nuclear weapons against the States of the zone, In addition, some States judge proposals for such zones also from the standpoint of their potential contribution not only to the security of the region concerned, but to international security in general.

For many years, debates have taken place in the General Assembly on the possibility of setting up nuclear weapon free zones in Africa, the Middle East, and South Asia. In addition, there have been proposals for the creation of such zones in other regions, including Northern Europe, Central Europe, the Balkans and South-East Asia. Some exploratory work has been carried out both at the regional and international level on these possibilities. However, no concrete negotiations have yet been initiated on any of these proposals. Although there has been considerable support for some proposals, not all of them have received support by all countries concerned.

C. Limitation on Stationing of Nuclear Weapons

Setting geographical limitations on the stationing of nuclear weapons is an approach to reducing the nuclear threat. Although there is no prohibition on deployment of nuclear weapons on the high seas, some States would like to have the seas used exclusively for peaceful and non-nuclear purposes. Others point to their rights to free navigation of the seas in customary law and under the United Nations Convention on the Law of the Sea. The agreements concluded so far in this respect, unlike nuclear weapon free zones, largely cover unpopulated territories on the Earth and in outer space. In one instance, the scope is also broader since it provides not only for denuclearisation, but also demilitarisation of the area.

1. The Antarctic Treaty

The Antarctic Treaty, concluded on 1 December 1959, was the first international agreement that, by establishing a demilitarised zone, *ipso facto* provided that nuclear weapons would not be introduced into a specified area. The Treaty bans "any measures of a military nature" such as the establishment of military bases and fortifications, military manoeuvres and the testing of any type of weapon. This was the first Treaty to provide for on-site inspection. The Treaty entered into force on 23 June 1961 and the number of parties to it has increased from the original 12 signatories in 1959 to 39 as at the end of 1989, including the five nuclear weapon States.

2. Outer Space Treaty

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) (resolution 2222 (XXI), annex), was opened for signature on 27 January 1967 and entered into force on 10 October the same year. As at 31 December 1989, 91 States had become parties to the Treaty.

The Treaty prohibits the placing in orbit around the Earth of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, installing such weapons on celestial bodies or stationing them in outer space in any other manner. The Treaty also affirms that the Moon and other celestial bodies are to be used exclusively for peaceful purposes and that the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies are to be prohibited.

A further instrument, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, was concluded in 1979. It entered into force on 11 July 1984. By the end of 1989, seven countries (Australia, Austria, Chile, Netherlands, Pakistan, Philippines and Uruguay) had become parties to it. It complements the Outer Space

Treaty and prohibits the use of force on the Moon, the placing of any weapons, including nuclear weapons, on or in orbit around it, or any kind of militarisation of it or other celestial bodies.

3. Sea-Bed Treaty

The Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof (Sea-Bed Treaty) (resolution 2660 (XXV), annex) was opened for signature on 11 February 1971. It entered into force on 18 May 1972. By the end of December 1989, 82 States had ratified the Treaty while 23 States had signed it but not yet ratified it.

The Treaty provides that the States parties to it undertake not to place on or under the sea-bed, beyond the outer limit of a 12-mile coastal zone, any nuclear weapons or any other weapons of mass destruction or any facilities for such weapons. All parties have the right to verify through observation activities of other States in the area covered by the Treaty.

Three Review Conferences of the parties to the Treaty have been held so far, in 1977, 1983 and 1989. At all three Review Conferences, the parties reaffirmed their commitment to the Treaty. In addition, at the general debate at the Third Conference, the Soviet Union, the United Kingdom and the United States for the first time declared that they "have not emplaced any nuclear weapons or other weapons of mass destruction on the sea-bed outside the zone of application of the Treaty as defined by its article II and have no intention to do so".

D. Limitations and Reductions of Nuclear Weapons

There have been a number of efforts to limit and reduce the stockpiles of nuclear weapons in the world. While the consideration of these issues took place both within the United Nations and the Conference on Disarmament, where nuclear disarmament is viewed as a priority item on their respective agendas, the actual negotiations on a number of specific measures were pursued in bilateral negotiations between the United States and the Soviet Union. In the process, these two nuclear weapon powers have concluded several agreements providing for quantitative limitations and some qualitative restrictions on their nuclear forces.

During the 1970s, the bilateral negotiations between the Soviet Union and the United States were carried out within the framework of the so-called strategic arms limitation talks (SALT), which resulted in the signing of several specific agreements. The negotiations continued in the early 1980s under a new name of the strategic arms reduction talks (START). In their joint statement of January 1985, the two sides defined their subject as a complex of questions concerning space and nuclear weapons, both strategic and intermediate/medium-range, with all the questions to be considered and resolved in their interrelationships. The statement also pointed out that "ultimately the forthcoming negotiations, just as efforts in general to limit and reduce arms, should lead to the complete elimination of nuclear arms everywhere".

Under the general umbrella entitled nuclear and space talks (NST), the negotiations have been conducted in three different groups assigned to deal respectively with strategic nuclear weapons, intermediate/ medium-range nuclear weapons, and defence and space issues. In the course of those negotiations, a great deal of progress has been achieved.

1. INF Treaty

A most significant result of bilateral efforts was achieved in 1987 with the conclusion of the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of their Intermediate-Range and Shorter-Range Missiles (INF Treaty). The Treaty is notable because it provides, for the first time, for the complete elimination of an entire class of American and Soviet nuclear missiles and because it contains unprecedented intrusive verification provisions. It was signed in Washington by President Reagan and General Secretary Gorbachev on 7 December 1987 and came into force on 1 June 1988. The Treaty is of unlimited duration.

In the preamble, the parties expressed their conviction that the measures set forth in the Treaty would help to reduce the risk of an outbreak of war. They also recalled their obligations under article VI of the Treaty on the Non-Proliferation of Nuclear Weapons, namely to pursue negotiations in good faith on effective measures for the cessation of the nuclear-arms race at an early date.

The basic obligation of the two parties consists of an undertaking to eliminate their intermediate-range and shorter-range missiles, together with their launchers, all support structures and support equipment. Intermediate-range missiles (1,000-5,500 km) would be eliminated not later than three years after the entry into force of the Treaty, while the elimination of shorter-range missiles (500-1,000 km) would be completed not later than 18 months after the Treaty's entry into force. The Protocol on Elimination provides that the nuclear warheads and guidance elements may be removed from the missiles, prior to their elimination, and retained by the deploying country.

The verification system of the Treaty provides, *inter alia,* for on-site inspection and inspection on short notice, and provides for non-interference with national technical means of verification. The on-site inspection covers the main facility of each side where components for missiles are being produced, i.e. the Votkinsk Machine Building Plant in the Soviet Union and the Hercules Plant in Utah in the United States. While intermediate-range missiles are prohibited, the Votkinsk plant also produces another type of missile that is also monitored. After two years of monitoring at both plants, if no such missiles are produced for one year, the monitoring portals will be removed and may not be replaced. Inspection on short notice applies to all specified sites other than production facilities. The inspectors are to be allowed to carry out such inspections not only during the initial 3-year period envisaged for complete elimination of these weapons, but also during the next one decade, thus extending the duration of the whole arrangement to 13 years altogether. Furthermore, the actual removal of the weapons covered by the Treaty from deployment areas and storage is subject to verification. Besides missile installations on American and Soviet soil, this includes American and Soviet missile bases in Western and Eastern Europe. Occasional inspection of the locations will take place also over a 13-year period.

Following the conclusion of the INF Treaty, the Warsaw Treaty States proposed in April 1989 negotiations on tactical nuclear arms in Europe. Those States were convinced that along with the elimination of the intermediate-range and shorter-range missiles, the phased reduction and eventual elimination of the tactical nuclear arms in Europe would help to lessen the danger of war, strengthen confidence and establish a more stable situation on the continent. This would, in their opinion, facilitate progress towards deep cuts in strategic nuclear arms and, ultimately, the complete elimination of nuclear weapons everywhere.

The member States of NATO, in their report entitled "A Comprehensive Concept of Arms Control and Disarmament" adopted at the NATO summit meeting in May 1989, declared that once implementation of an agreement on conventional force reductions in Europe was under way, the United States, in consultation with the allies concerned, was prepared to enter into negotiations to achieve a partial reduction of

American and Soviet land-based nuclear missile forces of shorter range to equal and verifiable levels. In April 1990, NATO agreed that negotiations on tactical nuclear weapons could start after the conclusion of an agreement on conventional force reductions in Europe.

Pursuant to NATO decisions taken in 1979 and 1983, the United States unilaterally withdrew 35 per cent, i.e. 2,400, of its nuclear weapons based in Western Europe. The Soviet Union, in the course of 1989, also unilaterally withdrew 500 tactical nuclear warheads from the territory of its allies. The Soviet Union furthermore declared that it was prepared to withdraw during 1989-1991 all nuclear ammunition from the territories of its allies on the condition of a similar reciprocal step on the part of the United States. In June 1990, the Soviet Union announced that by the end of 1990 it would unilaterally reduce in the European region 140 short-range missile launchers as well as 3,200 pieces of nuclear artillery and 1,500 nuclear charges.

2. Strategic Arms Reduction Talks

The United States and the Soviet Union are in the process of finalising an agreement on substantial reductions of their strategic nuclear arsenals, the so-called START agreement. In June 1990, Presidents Bush and Gorbachev on the occasion of their summit meeting at Washington issued a joint statement outlining the basic provisions of the future treaty. The two sides will translate the agreed outline into specific treaty language. It is their declared intention to complete this work within months.

The Treaty would provide for both sides to carry out up to 50 per cent reductions in certain categories of strategic offensive arms. The Treaty would also include a reduction in the overall number of warheads deployed on delivery vehicles (ICBMs/ SLBMs, heavy bombers) to no more than 6,000. The aggregate throw-weight of the deployed ICBMs and SLBMs of each side will be limited to 53 per cent below the present level of the Soviet Union. Heavy bombers equipped for long-range nuclear ALCMs will be counted as one delivery vehicle against the 1,600 limit and shall be attributed with an agreed number of warheads against the 6,000 limit. Existing and future United States heavy bombers equipped for long-range nuclear ALCMs will be attributed with 10 warheads each. Existing and future Soviet heavy bombers equipped for long-range nuclear ALCMs will be attributed with eight warheads each. The Treaty will also include specific prohibitions on certain categories of strategic offensive arms, basing modes and activities. The following items would be banned: new types of heavy ICBMs; heavy SLBMs and launchers for heavy SLBMs; mobile launchers for heavy ICBMs; new types of ICBMs and SLBMs with more than 10 re-entry vehicles; flight testing and deployment of existing types of ICBMs or SLBMs with a number of re-entry vehicles greater than the number specified in the Washington Summit Joint Statement of December 1987; rapid reload of ICBM launchers; long-range nuclear ALCMs equipped with multiple independently targetable warheads. Sea-launched cruise missiles (SLCMs) will not be constrained in the START treaty. On the other hand, each side will provide the other with unilateral, politically binding declarations regarding its planned deployment of nuclear SLCMs with a range over 600 km. The maximum number of deployed SLCMs for each of the following five treaty years will not exceed 880 for each side.

The verification regime for the reductions and other constraints to be contained in the treaty would include on-site inspections; national technical means of verification; a ban on denial of telemetric information; data-information exchange on numbers, locations and technical characteristics of strategic arms and an agreement on the manner of deployment of mobile ICBMs and limitations on their movements so as to ensure effective verification. A joint compliance and inspection commission will be established to promote the objectives of the treaty. The treaty would have a duration of 15 years with the possibility of extension for successive five-year periods.

3. Strategic Arms Limitation Talks

Although new arrangements on strategic armaments, most notably the forthcoming START treaty, would go much farther than previous treaties, the strategic arms limitation talks (SALT) between the United States and the Soviet Union in the 1970s have played an important role in the efforts of the two sides to place certain limitations on the development of their nuclear weapon arsenals.

Thus, by the Interim Agreement between the United States of America and the Union of Soviet Socialist Republics on certain measures with respect to the limitation of strategic offensive arms (SALT I), with a Protocol attached, the two sides undertook not to start construction of additional fixed land-based ballistic missile launchers and to limit submarine missile launchers and modern ballistic missile submarines to an agreed level for each side. The limits agreed upon allowed, however, for an additional increase in the total number of the strategic forces of the two sides. However, the SALT II agreement, signed in June 1979, set totals not only on missiles, but also on sub-category totals. The ceilings agreed upon went quite a way towards dealing with the very different needs of the United States, which had most of its warheads on submarines in the form of SLBMs, and the Soviet Union, which had most of its strategic assets in ICBM silos. It brought the long-range bomber forces into the calculations and even considered the new technology of air-launched cruise missiles (ALCMs). It did not reduce the number of warheads either side had, or restrict the use of any existing technology, but it did restrict major new technological developments and set some predictability in the strategic selection. It also served to work out many definitions and issues that were carried over into subsequent negotiations, such as START. Although the SALT II Treaty has not been formally ratified, both parties have in general observed the limitations set by it. These limitations will, however, be largely superseded by the terms envisaged under the START agreement.

Another important agreement concluded in the framework of SALT negotiations was the 1972 Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty), subsequently amended by a Protocol of 3 July 1974. By the ABM Treaty, the Soviet Union and the United States undertook not to develop, test or deploy mobile land- or sea-based, air- or space-based ABM systems. They also agreed to limit ABM systems to two sites with no more than 100 launchers at each site. In 1974, the Treaty was amended by a Protocol that limited each side to one ABM deployment area only. The Soviet Union chose to maintain its ABM system in the area centred on its capital, Moscow, and the United States chose to maintain its system in the ICBM deployment area in North Dakota. Subsequently, the United States decided not to deploy its ABM system at all.

The ABM Treaty received considerable attention in the bilateral negotiations following the announcement of the United States strategic defense initiative (SDI) in 1983. The Soviet Union took the position that the provisions of the ABM Treaty prohibited all testing of ballistic missile defence systems and their components in outer space. For its part, the United States has maintained the position that the SDI research programme is not incompatible with the ABM Treaty.

Besides different interpretations of the relationship between SDI and ABM Treaty, the Soviet Union and the United States disagreed on the effect that such a programme, if and when fully developed, might have on the strategic balance between the two sides. The United States views it as an entirely defensive programme with no effect on START, while the Soviet Union held the view that the programme if implemented would deny it second strike retaliatory capability, the preservation of which for both sides constitutes the essence of the ABM Treaty. In September 1989, the Soviet Union expressed its willingness to sign and to ratify the START treaty without waiting for the completion of bilateral discussions of the ABM problem. At the same time, it proceeds from the assumption that both sides will continue to comply with the existing ABM Treaty as signed, and that its violation by any side would automatically relieve the other side from its obligations under the START treaty. The United States and the Soviet Union have also declared their commitment to work towards early and effective agreements aimed at preventing an arms race in space and terminating it on the Earth.

The question of outer space first became the subject of bilateral negotiations between the United States and the Soviet Union in the 1970s. The initial discussions took place from 1977 to 1979 and focused on the question of anti-satellite activities. In August 1983, the Soviet Union proposed to the United States to ban ASAT systems and to eliminate existing ones, but the United States did not agree to this proposal. The new bilateral negotiations began in 1985 as part of the nuclear and space talks (NST), which also included START and INF as separate negotiations. At the Washington summit meeting in May/June 1990, both sides agreed to continue negotiations on ABM and space within the negotiating framework of NST.

E. Limitation on Testing of Nuclear Explosive Devices

Since nuclear testing is an inherent part of the process of development of nuclear weapons, many States have given highest priority to a comprehensive nuclear test ban (CTB), i.e. a prohibition of all tests, in all environments. They point out that such a ban would introduce uncertainties in the qualitative development of nuclear weapons that would make the development of these weapons more difficult; that it would also largely prevent the acquisition of nuclear weapons by States that do not have them; and that it would, therefore, contribute to the goal of nuclear non-proliferation. Nuclear weapon States, with the exception of the Soviet Union, are not prepared to accept a nuclear-test ban, because they assess nuclear testing as essential for the credibility, reliability and survivability of their nuclear deterrent forces. The United States has stated that a CTB remains a long-term United States objective and that such a ban must be viewed in the context of a time when the

United States no longer needs to depend on nuclear deterrence to ensure international security and stability, and when it has achieved broad, deep and verifiable arms reductions, greatly improved verification capabilities, expanded confidence-building measures and greater balance in conventional forces.

In 1963 the Soviet Union, the United Kingdom and the United States concluded a Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water. The Treaty was negotiated in response to environmental and other concerns being expressed at the time. It does not prohibit underground tests provided they do not cause radioactive debris to be present outside the territory of the State where the test was conducted. In its preamble, however, it notes the objective of achieving "the discontinuance of all test explosions of nuclear weapons for all time". The Treaty has since been joined by many other States and had, as at June 1990, 118 parties. Two nuclear weapon States, France and China, are not parties, although they announced, in 1974 and 1986 respectively, that their future tests would be carried out only underground. France has stated that it is not prepared to enter any comprehensive test-ban agreement, although President Mitterrand has recently indicated that France would not be the last to stop testing. China stated that it was flexible towards the creation of the subsidiary body in the Conference on Disarmament on the issue. It also stated that if and when an agreement was reached on a mandate enabling such a body to be established, it would participate in its work.

In 1974, the United States and the Soviet Union signed the so-called Threshold Test Ban Treaty (TTBT), which prohibits all weapon tests with a yield exceeding 150 kilotons. Because it is impossible to distinguish nuclear weapons tests from nuclear explosions for peaceful purposes, in 1976, both States also signed the Peaceful Nuclear Explosions Treaty (PNET) which puts a 150-kiloton limit on such explosions. Difficulties arose in connection with verification procedures for both Treaties and, therefore, neither Treaty was ratified. In 1987, the United States and the Soviet Union agreed to a step-by-step approach to the objective of the ultimate cessation of all testing and in that context initiated negotiations on improved verification procedures for those Treaties. Following the successful conclusion of those negotiations, during the Washington summit meeting in May/June 1990, the Soviet Union and the United States signed verification protocols for both Treaties, which will pave the way for their ratification by the respective legislative bodies of the two countries.

International efforts to achieve a complete test ban began in the 1950s. From 1977 to 1980, three nuclear weapon States, the Soviet Union, the United Kingdom and the United States, held negotiations on a comprehensive test ban without reaching final agreement. The Conference on Disarmament at Geneva was periodically informed on the progress of these trilateral negotiations.

Most States have taken the position that the step-by-step approach agreed on by the United States and the Soviet Union is insufficient because it does not specify when a comprehensive ban is to be achieved. They continue to call for an immediate ban on all testing. At the United Nations, General Assembly resolutions attaching the highest priority to the conclusion of a comprehensive nuclear-test ban have been voted on and adopted by an overwhelming majority. The Conference on Disarmament has been requested by the Assembly in successive years to begin negotiations on such a treaty. Some States have submitted draft treaties and different proposals on this subject to the Conference on Disarmament, but no negotiations have been initiated. Given their position on the issue, most nuclear weapon States remain opposed to the commencement of multilateral negotiations towards a CTBT in the Conference on Disarmament. At the same time, they have stated their readiness to discuss issues related to such a ban on a non-negotiating basis.

Recently, some States parties to the PTBT have proposed amending the Treaty into a comprehensive test ban. In accordance with the amendment procedure provided for in the Treaty, any amendment requires the consent of all three original parties. A meeting for the organisation of the conference was held from 29 May to 8 June 1990 and adopted a number of organisational decisions. The Amendment Conference is scheduled to be held at New York from 7 to 18 January 1991, although two of the original parties, the United States and the United Kingdom, have already stated that they will oppose the proposed amendment.

Stating that it would uphold the idea of a CTB and that it wishes to promote it by practical steps, the Soviet Union held a unilateral moratorium on nuclear teats for 18 months in 1985-1987. No other nuclear weapon State followed the Soviet Union's move.

As noted before, bans on testing have also been included in the two nuclear weapon free zone Treaties. The Treaty of Tlatelolco prohibits weapons testing in Latin America and the Caribbean. In view of their expressed concerns about nuclear weaponry and about the possible environmental effects of testing, the parties to the Treaty of Rarotonga undertook to prevent the testing of any nuclear explosive device in their territories and throughout the zone, and not to assist or encourage the testing of any such device by any State.

The verification aspects of a comprehensive test ban have received considerable attention. A variety of means, including satellite data and radiation monitoring, have allowed the international community to verify adherence to the ban on atmospheric tests. Underground testing has traditionally been monitored using seismic techniques although other techniques have been devised as a complement. Efforts are being made in the Conference on Disarmament to design a global seismic network for acquisition and exchange of data. Many believe that seismic monitoring, backed up by other methods, could detect and identify tests down to very low yields (1-2 kilotons) and that this testing threshold would impose severe constraints on nuclear weapons development. However, there is some concern that no verification system would be able to detect sub-kiloton explosions.

The verification arrangements agreed upon in the verification protocols to the TTBT and the PNET, signed at the Washington summit meeting in May/June 1990, include hydrodynamic yield measurement (the so-called CORRTEX method), on-site inspection and seismic monitoring on the territory of the testing party as well as national technical means.

F. Constraints on the Use of Nuclear Weapons

Over the years, many initiatives have been put forward concerning the prohibition or limitation of the use of nuclear weapons. In the process, various approaches developed on this issue. They ranged from the calls for unconditional prohibition of the use of nuclear weapons to prohibition of first use and various conditional bans. After the conclusion of the 1968 Treaty on the Non-Proliferation of Nuclear Weapons, the question of adequate security assurances to non-nuclear weapon States against the use of nuclear weapons emerged. Such guarantees were also contemplated within the framework of the establishment of nuclear weapon free zones in various regions of the world. Still another approach dealt with the limitation of the use of nuclear weapons from the point of view of customary norms of international humanitarian law in conventional wars as the basis for deriving some principles applicable to nuclear weapons as well. The question of the prohibition of the use of nuclear weapons was also considered within the broader question of the prevention of war, in particular nuclear war. This approach gained prominence especially during the 1980s.

No tangible progress has been made towards the conclusion of an agreement regarding the non-use of nuclear weapons. Many nations have expressed the hope that the depth and scope of changes presently taking place in international relations, particularly between the two major nuclear weapon States, has considerably diminished the likelihood of their possible deliberate use. The main thrust of various approaches to this issue, particularly those pursued in the last decade, are described briefly below.

1. Consideration in the General Assembly

The General Assembly has passed a great number of resolutions on this subject. With the exception of procedural resolutions, all resolutions have been adopted by vote. The voting has shown deeply rooted divergencies, reflecting different strategic doctrines and national security perceptions.

The question of the use of nuclear weapons received a great deal of attention at the 1978 special session of the General Assembly devoted to disarmament in a broader context of the elimination of the danger of war. At that session, the five nuclear weapon States made individual declarations with regard to security assurances to non-nuclear weapon States.

At the second special session of the General Assembly devoted to disarmament in 1982, various suggestions and proposals were put forward. The Soviet Union, for instance, declared that, with immediate effect, it assumed an obligation not to be the first to use nuclear weapons, because it believed that should a nuclear war start it could mean the destruction of humankind. A similar statement already had been made by China in 1964 when it exploded its first atomic weapon. The United Kingdom, also at the second special session on disarmament, stated that it was its long-established policy that nuclear weapons should never be used except in self-defence under most extreme circumstances.

In the consideration of the issue, the United States and other Western countries pointed out that a declaration on the non-first use of nuclear weapons would restrict and undermine the wider principle of self-defence enshrined in the Charter of the United Nations. They noted that the Charter provided that States refrain from the threat or use of force in their international relations (Art. 2.4) but that it did not impair the inherent right of individual or collective self-defence if an armed attack occurs (Art. 51), and it did not contain any prohibition of any specific means of warfare.

At its thirty-seventh session and subsequently, in resolutions initiated by Argentina, the German Democratic Republic and India, the General Assembly, respectively recommended that the Conference on Disarmament undertake negotiations on: appropriate and practical measures that could be negotiated and adopted individually for the prevention of nuclear war; an international instrument of a legally binding character laying down the obligation not to be the first to use nuclear weapons; and an international convention prohibiting the use or threat of use of nuclear weapons under any circumstances, taking as a basis the text of a draft convention annexed to it.

2. Actions and Statements Outside the United Nations

In 1984, for the first time, the Conference on Disarmament included in its agenda a separate item entitled "Prevention of nuclear war, including all related matters". While all members recognised the importance of the prevention of nuclear war, there remained differences in approach between various groups. Eastern European and non-aligned States, believing that the removal of the threat of nuclear war was the most urgent task, urged the Conference to undertake, as a matter of highest priority, negotiations on measures for the prevention of nuclear war and to establish an ad hoc committee for that purpose. For their part, Western countries maintained that the question of preventing nuclear war could not be isolated from the problem of preventing war in general and that the question at issue was how to maintain peace and international security in the nuclear age. As a result of these differences in approach, matters related to the non-use of nuclear weapons and prevention of nuclear war have continued until now to be considered only in plenary meetings of the Conference.

The question of constraints on the use of nuclear weapons and the prevention of nuclear were was also addressed on several occasions by various world leaders. Their statements have made an impact on the deliberations and negotiations in various forums.

For instance, the joint message of 24 October 1985 by the Heads of State or Government of six countries—Argentina, Greece, India, Mexico, Sweden and the United Republic of Tanzania—(the so-called "Six-Nation Initiative") directed to the leaders of the United States and the Soviet Union in connection with their summit meeting stated that "since the citizens of all nations are equally threatened by the consequences of nuclear war, it is of utmost importance to us also that your meeting should create appropriate conditions and produce concrete steps towards disarmament and peace".

The United States-Soviet joint statement issued on 21 November 1985 on the occasion of the summit meeting between President Reagan and General Secretary Gorbachev stated that the two leaders, conscious of the special responsibilities of their respective countries for maintaining peace, "have agreed that a nuclear war cannot be won and must never be fought" (A/40/1070, annex). Furthermore, "they emphasised the importance of preventing any war between them, whether nuclear or conventional" and stated that they would not seek to achieve military superiority. In the joint statement issued at Washington on 10 December 1987, (A/43/58, annex) following their signing of the INF Treaty, President Reagan and General Secretary Gorbachev affirmed the fundamental importance of their meetings at Geneva (1985) and Reykjavik (1986), which had laid the basis for concrete steps in a process intended "to improve strategic stability and reduce the risk of conflict".

In February 1988, the six nations issued the Stockholm Declaration, in which they welcomed the signing of the INF Treaty (A/43/125-S/19478, annex). They viewed it as a "historic first step" and as significant evidence that "a reversal is possible". They also pointed out that no nation had the right to use nuclear weapons and declared that "what is morally wrong should also be explicitly prohibited by international law through a binding international agreement".

At the special ministerial meeting of the Non-Aligned Countries held at Havana in May 1988, the Final Communique stated:

> "The Ministers emphasised that, pending the attainment of general and complete disarmament—a process in which nuclear disarmament plays a central role—it was necessary for nuclear weapon States, *inter alia,* immediately to negotiate an agreement on the prohibition of the use or the threat of use of nuclear weapons and to pledge not to be the first to use them. The Ministers further urged that non-nuclear weapon States be given assurances against the threat or use of nuclear weapons by any nuclear weapon State."

The Declaration issued at the Conference of Heads of State or Government of Non-Aligned Countries at Belgrade in September 1989 said:

> "The USSR and the USA have, for the first time in history, signed a treaty to eliminate some of the existing nuclear weapons. The Heads of State or Government welcomed this step and reiterated their expectation that it would be a precursor to the adoption of concrete disaramament measures leading to the complete elimination of nuclear weapons."

3. Security Assurances

The question of security assurances to non-nuclear weapon States was first raised specifically in connection with the negotiations at the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

In order to provide a counterbalance to the undertaking of the non-nuclear weapon States not to acquire nuclear weapons, as embodied in the Non-Proliferation Treaty, three nuclear weapon States—the Soviet Union, the United Kingdom and the United States—agreed to provide certain security assurances to these countries through a Security Council resolution.

Security Council resolution 255 (1968) recognised that aggression with, nuclear weapons, or the threat thereof, against a non-nuclear weapon State party to the Treaty would call for immediate action by the Council and, above all, by its nuclear weapon States permanent members. The Council also welcomed the intention expressed by certain States to assist any non-nuclear weapon State party to the Non-Proliferation Treaty that was a victim of an act or threat of nuclear aggression and reaffirmed the right to collective self-defence under Article 51 of the Charter of the United Nations.

However, a number of non-nuclear weapon States, while welcoming the "positive" assurance provided for in the resolution, expressed preference for "negative" assurance, i.e. a commitment by nuclear weapon States that they would not use or threaten to use nuclear weapons against non-nuclear weapon States. All five nuclear weapon States have provided unilateral negative security assurances, although those assurances reflect the different security perceptions of the nuclear weapon States.

The question has been actively considered by the Conference on Disarmament. Each year since 1979, with only one exception, 1986, the Conference on Disarmament has established *ad hoc* working bodies on effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons. Although there has been no objection in principle to the idea of an international convention, the difficulties involved as regards developing a "common formula" on the substance of security assurances, which would be acceptable to all States, have also been pointed out.

In recent years, the search for a common formula in the ad hoc committee on the nature and scope of security assurances has focused on the consideration of various new ideas put forward on the understanding that an agreement on the substance of the arrangements would facilitate the agreement on their form. Two basic approaches have been examined at the Conference on Disarmament negotiations the single common formula and the "categorisational approach". The former seeks to find one common formula of security assurances covering all non-nuclear weapon States which are to be assured. The latter envisages that a specific common formula should be developed for each category of non-nuclear weapon States, which, in order to take into account the diversity of their security situations, are categorised along the lines of certain criteria (such as non-nuclear status, non-stationing of nuclear weapons, alliance status) as already reflected in the unilateral declarations of the nuclear weapon States.

The idea of following a step-by-step approach has also been advanced, with the understanding that, when viewed in a broader perspective, the two basic approaches could complement each other. Various views on the suggested approaches have been expressed at the negotiations in the Conference on Disarmament and their consideration remains inconclusive. In November 1989, Nigeria submitted for consideration by the States parties to the Non-Proliferation Treaty a proposal for an agreement on the prohibition of the use or threat of use of nuclear weapons against non-nuclear weapon States parties to that Treaty. The proposal was also submitted to the Conference on Disarmament in March 1990, and to the Fourth NPT Review Conference.

G. Confidence-Building Measures

The general goal of these measures is to reduce and possibly eliminate causes for mistrust, misunderstanding and fear, all of which contribute to instability and insecurity. There is need for confidence-building in many fields—political, military, economic and social, among others. Traditional security concerns, mainly military, have been, however, the main source of confidence-building measures (CBMs). Where confidence already exists. CBMs are a way to reinforce it, but they are no substitute for arms regulation and disarmament measures as such.

Regarding the CBMs specifically concerned with various aspects of nuclear weapons, wide-ranging efforts have been promoted by nuclear weapon States, most notably the United States and the Soviet Union, but also France and the United Kingdom. Most of the agreements in this field were concluded in the 1960s and 1970s and were related to the process of the strategic arms limitation talks.

Thus, in September 1987, the two sides concluded an Agreement on the Establishment of Nuclear Risk Reduction Centres. According to the Agreement, each party shall establish in its capital a national nuclear risk reduction centre (NRRC). The parties shall use the centres to transmit the following types of notifications: notifications of ballistic missile launches under article IV of the Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War between the USSR and the United States of 1 September 1971; notifications of ballistic missile launches under paragraph 1 of article VI of the Agreement between the USSR and the United States on the Prevention of Incidents on and over the High Seas of 25 May 1972; other communications that each party may, at its own discretion as a display of good will and with a view to building confidence, transmit to the other party. In May 1988, the Soviet Union and the United States signed an Agreement on Notifications of Launches of ICBMs and SLEMs. According to that Agreement, each party agreed to provide the other party notification, through the nuclear risk reduction centres, no less than 24 hours in advance, of the planned date, launch area and area of impact for any launch of an ICBM or SLBM.

In June 1989, they signed an Agreement on the Prevention of Dangerous Military Activities, reflecting the desire of the two States to reduce the risk of outbreak of nuclear war, in particular as a result of misinterpretation, miscalculation or accident. The accord, which took effect on 1 January 1990, covers four areas of possible conflict: (a) an agreement to refrain from the use of force in the event of a border incursion by the other nation's military forces, aircraft or ships; (b) an agreement not to use laser-range finders or other like devices while the two sides' forces are in close proximity. These devices can temporarily blind soldiers if they are struck directly in the eye; (c) an agreement to set up "special caution zones" in areas such as the Persian Gulf, when both sides' forces come into contact; and (d) an agreement to refrain from electronic jamming of either side's command and communications systems.

It is also envisioned that direct communications between the nations' military units in the field will be established to prevent misunderstandings. At the Wyoming ministerial meeting, held in September 1989, both sides signed an agreement on advance notification of major strategic exercises. Under this agreement, each side must provide the other side, on a reciprocal basis, with no less than 14 days' advance notification of the commencement of the one large-scale strategic exercise, with the participation of heavy bombers, which it intends to conduct in the course of each calendar year. At the Washington summit meeting, in May/June 1990, the Soviet Union and the United States agreed to pursue new talks with the objective of reducing further the risk of outbreak of war, particularly nuclear war, and of ensuring strategic stability, transparency and predictability.

H. Nuclear Weapons and International Law

Despite wide-ranging discussions in various forums, no uniform view has emerged as yet on the legal aspects of the possession of nuclear weapons and their use as a means of warfare.

The Charter of the United Nations, a document signed just before the world entered the nuclear era, does not refer to the existence of nuclear weapons. The Charter states, in Article 51, that "nothing... shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations". Under the circumstances, the question of which means are acceptable for exercising the right of self-defence if an attack occurs is left to treaty regulations and to customary law.

Some countries, including nuclear weapon States, consider that nothing in the existing treaty practice of States or in international customary law could be construed to apply to the question of the legality of nuclear weapons either directly or indirectly. Furthermore, they take the position that the use of these weapons is the subject of the decision of the national authorities of the country concerned, which is based on the considerations of its national security requirements and, when applicable, the specific commitments explicitly undertaken in that regard, such as those envisaged in connection with nuclear weapon free zones.

On the other hand, many countries believe that norms and emerging norms relating to the legality of nuclear weapons and their use derive from a variety of existing sources. In this connection, they point out that the Statute or the International Court of Justice indicates as sources of international law, besides treaties, also "international custom, as evidence of a genera] practice accepted as law" and "the general principles of law recognised by civilised nations". It is thus argued that in dealing with the question of the regulation of the possession and the use of nuclear weapons, the guiding principles could be drawn not only from specific treaty provisions, but also from international customary law, general principles of law, judicial decisions and, in some cases, from the resolutions of the Security Council.

The proponents of this approach, for instance, point out that customary norms of international humanitarian law applicable in armed conflicts contain some general principles that could be considered to impose certain constraints on the use not only of conventional, but also of nuclear weapons. In their view, the well-established principle in the law of armed conflicts that "the right of the Parties to the conflict to choose methods or means of warfare is not unlimited' is particularly relevant. They also maintain chat there are many other principles of international customary law that have in fact been reflected in modern treaty practice.

In this context, they usually refer to the following: (a) a ban on means or methods of warfare that cause unnecessary suffering (in relation to the military objectives that the belligerents hope to attain); (b) the requirement of distinction (between military targets on the one hand and the civilian population and its property on the other); (c) a ban on warfare that leads to indiscriminate effects (weapons or methods of warfare that strike at random against military and civilian values); (d) proportionality (excessive civilian losses when compared with the concrete and direct military advantage to be expected from the attack).

Although those principles largely overlap, at the same time, in the opinion of their proponents, their implications are far-reaching. Thus, for instance, the principle of distinction, that both a civilian population and civilian objects as such must not become the target of an armed attack, would imply that "counter-value" strikes would not be allowed. Likewise, the principle of indiscriminate effects means that nuclear attacks that would lead inexorably to massive civilian losses must be avoided. From the principle of proportionality, they infer that nuclear weapons may not as a rule be used in densely populated areas.

It is, however, not clear in juridical theory how the existing customary law could be applied with regard to the regulation of the production and possession of such weapons. It is argued in this connection that for a norm to have the status of international customary law, it must reflect a general perception of the norm as legally binding (an opinio juris) and be shown to prevail among the members of the international community. Although there are other views on this question, the fact remains that no consensus (or "near consensus") and thus no general opinio juris has emerged on the question of the production and possession of nuclear weapons.

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TOWARDS NUCLEAR ARMS LIMITATION AND GLOBAL DISARMAMENT AFTER REYKJAVIK

The Reykjavik summit between General Secretary Miklail Gorbachev and President Ronald Reagan in October 1986 has been described as "a planetary watershed" the Hofdi House deliberations could have turned out to be that, but for some post-Reykjavik incidents which call for caution in the assessment to likely future developments. Only a year before Reykjavik, its antecedents and the terse exchanges between the American and Soviet administrations had led one prominent scholar in modern strategy to conclude that " the possiblilities of complete nuclear disarmament by negotiation or unilateral actions look immensely remote. For an indefinite period ahead, mankind is condemned to live under the shadow of the nuclear bomb" But, Reykjavik raised man's hope for the prevention of nuclear war, the cessation of nuclear weapon tests and the prevention of an arms race in outer space. The four intensive sessions produced some principles regarding a phased elimination of all nuclear weapons during a 10-year period. Previous differences were narrowed on such issues as intermediate-range nuclear forces (INF), testing deep cuts in offensive nuclear missiles and their types.

Quite recently, however, NATO defence ministers met at Stavanger, Norway, and prompted a shift in the United states bargaining position in Geneva by which the remaining 200 INF warheads would be included in a prospective arms accord in line with President Reagan's desire for the elimination of all warheads. Apparently in reaction to this, during a Kremlin banquet in honour of visiting Vietnamese leader Nguyen Van General Secretary Gorbachev reiterated that the Soviet Union resolve the problem of INF on a global basis if the United States agreed to dismantle its nuclear capability in Japan, the Republic of Korea and the Philippines, as well as withdraw its aircraft carriers beyond agreed limits. All these, against the background of the Super-Powers' traditional postures and manipulations in the nuclear-arms race, call for a critical examination of Reykjavik and beyond in our campaign for world disarmament.

Antecedents

Since the beginning of the SALT negotiations in 1969, indeed since Stalin's death, Soviet-American relations have witnessed some ups and downs. It has been a long period of mutual frustrations and worrisome coexistence, the result of the strategic arms race and its action-reaction structure that sustains the inconclusiveness of the arms control negotiations. These negotiations should not be seen as mere processes and products of the arms competition between the United States and the Soviet Union; they lie at the centre of world peace and international security.

For any analysis of the arms control negotiations to be relevant with respect to the present strategic situation and possible future trends, however, cognizance must be taken of their precedents. It is logical to trace their roots to the system of naval arms control established by the Washington Treaty Limiting Naval Armament of 1922 and the London Treaty for the Limitation and Reduction of Naval Armament of 1930 and the Protocol of 1936. These negotiations could be said to represent organised attempts to limit naval armaments in the inter-war years in the same way in which SALT, the Strategic Arms Reduction Talks (START) and INF represent contemporary efforts to limit strategic armaments. With regard to SALT, for instance, this view is partly based on the premise identified by Hedley Bull as follows:

> "First, the naval treaties were the result of realistic and businesslike negotiations designed to establish formal limitations on a particular category of armaments of major strategic importance... Second, the naval treaties were concerned with quantitative limitations... Third, in attempting to deal with 'the problem of the ratio' the naval arms negotiators accorded a central place to the idea of 'parity'... Fourth, the naval treaties were an attempt to determine an agreed ratio of naval strength among the dominant naval powers, especially the British Empire and the United States... Fifth, like SALT, the attempt to limit naval arms was part of a wider long-term disarmament effort... Sixth, in the naval arms conferences as in SALT, the discussions assumed that verification of any agreement would not require formal inspection procedures, 'reciprocal' or international, but would be carried out by unilateral intelligence..."

The similarities between SALT and the naval Treaties noted above are, without doubt, startling, but it is inaccurate to suggest that they alone constitute SALT'S precedents. The historical basis of SALT could also be found in other negotiations whose format and subject were, of course, not very similar to those of SALT. The various proposals put forward between 1946 and 1960 for comprehensive disarmament were more ambitious than those contained in the SALT negotiations, while the latter—by emphasising numerical limitation in addition to some prohibition—are of greater strategic significance than the non-proliferation Treaty, the partial test-ban Treaty and the outer space Treaty. Yet all these Treaties constitute the background to SALT, INF, START and the Reykjavik meeting.

One factor which influenced the post-global war, pre-SALT negotiations was the transformation of the global political situation. Not only did States terminate their obligations and violate specific disarmament provisions, but a chain of internal and external events was sparked off which altered the political and strategic context of any future Super-Power negotiations. Moreover, the possibility of greater technological innovation or breakthrough by an adversary prompted each Super-Power to wish to stabilise the strategic balance. Strategic calculations soon became compounded by economic, political and technological rationales.

The increase in defence expenditures that became apparent in the pre-SALT period was an indication that at some point it might become difficult for the two economic systems to sustain the strategic buildup. Politically, the opposing blocs had become relatively tolerant of each other towards the end of the 1960s and the possibility that the cold war would lead to a real or "hot" war by the Super-Powers was low. Added to this was the movement to settle the German question. But, by far the most significant of the historical conditions or causal factors responsible for the SALT negotiations were *(a)* the rough parity between Soviet-American strategic nuclear forces and *(b)* widespread restiveness among the scientific elite, its pressure on the various Governments' leadership, and the latter's interest in preventing nuclear war.

Ramifications of SALT

If negotiations have been based upon the premises noted above, what then do they actually represent in a nuclear environment that is no longer bipolar? What are the objectives and their implications? We shall begin with SALT. Mason Willrich once noted that "the central meaning of SALT is political. In an overall appraisal of SALT, an enormous array of diverse military, economic, technical and psychological factors must be filtered through a political lens. In so doing, the light from each factor is diffused and the images become blurred, but the impression one gains is closer to reality."

SALT could also be interpreted to mean that the Soviet Union and the United States had heeded Sir Winston Churchill's advice that "jaw-jaw is better than war-war". SALT Treaties have, of course, been part of the efforts to avoid war. We hardly need to be reminded that they were geared towards agreement on measures designed to limit strategic offensive forces, constrain strategic defensive systems, freeze qualitative improvements in weaponry and curb the deployment of new weapons. The implications of these a decade ago were different for both the Soviet Union and the United States. The latter, for instance, had for almost two decades boasted of maintaining superior nuclear forces in terms of size, delivery capabilities and flexibility of response.

In order for the Super-Powers to effectively limit their strategic offensive forces, they had to agree on the nature or categories of such forces, the level to set as the limit, and the extent and type (e.g., two thirds of the existing submarine-launched ballistic missiles, bombers, etc.) of the limits. For them to constrain the strategic defences, they had to ascertain *all* the uses to which the complex systems (including such equipment as the relatively simple fighter-interceptors) could be put and to be sure that agreed restrictions would be readily enforceable and easily verifiable. The freezing of qualitative improvements suggested preventing the production of larger missiles with heavier pay-loads and perhaps limiting the accuracy of re-entry vehicles with the massive power to knock out land-based missiles. Finally, for any restriction on new weapons to be meaningful, the negotiating powers had to be in a position to regulate the development of new weapons (with attendant psychological and political advantages) capable of threatening the strategic balance and to forestall "cheating" in the game.

The above conditions were the major challenges faced by the two Super-Powers while negotiating the SALT I agreement in 1969—20 years after the Soviet Union had shocked the United States by exploding a nuclear weapon and about a dozen years after the launching of Sputnik. But, for the Soviet invasion of Czechoslovakia in 1968, the talks might have taken off then. That invasion was often cited as the reason for the United States review of its strategic options, and it was after the review had recommended that the United States should settle for strategic parity that President Nixon opted for a strategy of "nuclear sufficiency". Even then, it was difficult to resolve the problem of emphasis in strategic policy, that is, whether it should be on bombers or missiles, offence or defence, intercontinental ballistic missile (ICBM) or submarine-launched ballistic missile (SLBM), etc.

The entire process of SALT was geared towards stability, which could be viewed as two-fold or manifold. It was, indeed, concerned essentially with crisis stability and dynamic stability. Of course, SALT I started a process of mutual enlightenment, which was necessary for achieving its ultimate goal of preventing any strategic nuclear war, and was dictated by the logic of national security. The first phase of the negotiations, SALT I, brought about the signing of two agreements: the first, the Treaty limiting ABM systems, and the second, the Interim Agreement providing for certain limitations on strategic offensive weapons for a five-year period. Both entered into force on 3 October 1972.

SALT II, the second phase of the bilateral negotiations, started in November 1972 and continued for two years, leading to a joint statement on 24 November 1974 at Vladivostok, USSR. There and then the United States President and the General Secretary of the Communist Party of the Soviet Union agreed, in principle, that a new agreement should be concluded in 1975 to cover the period until 31 December 1985. The general provisions of the agreement were to include limiting the aggregate number of strategic delivery vehicles on each side to 2,400 and establishing a sublimit of 1,320 on ICBMs and SLBMs equipped with multiple independently targetable re-entry vehicles (MIRVs).

Since SALT I was able to achieve so much, greater expectation was placed on SALT II. For instance, SALT I's ABM Treaty was able to limit ABM systems to only one site for each side (the two originally permitted under the Treaty were reduced to one by the ABM Protocol of July 1974) for ABM deployment—with tight restrictions on the ABM launchers and radars at the site. The Interim Agreement on strategic offensive arms and its Protocol froze the number of fixed ICBM launchers and permitted an increase in SLBM launchers up to an agreed level. Thus, the United States was allowed 1,054 ICBMs and 710 SLBM launchers, and the Soviet Union was allowed 1,618 ICBMs and 950 SLBMs. There was speculation that the United States was compensated for the Soviet Union's numerical advantage by some brand of heavy bombers and MIRVs. With this achievement by SALT I, why did SALT II—among other goals—ascertain numerical equivalence?

With the deployment of a new set of high-pay load ICBMs (the SS-17, -18 and -19) tested with MIRVs by the Soviet Union in late 1973, the American leadership was faced with the challenge of forcing the Soviet Union to limit the total payload or throw-weight that its missile force could deliver, but President Nixon's attempt at this did not succeed. This, at least, could be said to partially explain why the Ford Administration, during the November 1974 negotiations at Vladivostok, returned to the simpler and less controversial principle of only limiting launcher numbers in a new treaty lasting until 1985. It was possible to eventually adopt the equal ceilings for three reasons:

(a) The ceiling would not compel the Soviet Union to undertake any reductions in its growing arsenal and would, of course, include heavy bombers in which the United States had a crucial edge;

(b) The American leadership was convinced that the ceilings would not deter it from responding to any Soviet buildup either by deploying a larger proportion of forces at sea or by replacing the Minuteman ICBM forces with a new mobile missile (such as the American Air Force's all-powerful 150,000-lb MX, which had not gone beyond the stage of proposition);

(c) The Soviet aircraft bomber TU-26, known as "Backfire" in NATO circles, was not brought under the 2,250 ceiling on overall launchers. In the opinion of the Soviet Union, the TU-26 was an intermediate-range system, deployed primarily for use against targets in Western Europe and East Asia. This argument placed the Soviet bomber on the same plane as the American cruise missile.

The negotiators on both sides were, of course, aware that the TU-26 was indeed a medium-range bomber. But, they were also aware that it could acquire a genuine two-way intercontinental capability with aerial refuelling. Like the cruise missile, it was left out of the ceiling because its production rate would be frozen and its basing, refuelling and modernisation would be restricted. Other relevant provisions of the SALT II Treaty included a ceiling of 1,320 (within the 2,250 aggregate) on the total number of land and sea-based MIRVed missiles, as well as heavy bombers equipped with air-launched cruise missiles (ALCMs); a sub-ceiling of 1,200 on the total number of land and sea-based MIRVed missiles and an 820 sub-ceiling on MIRVed ICBMs. Moreover, new missiles with payloads exceeding the Soviet SS-19 ("Savage's Uncle") would be counted as heavy ICBMs, while the testing and deployment of long-range ALCMs were to be restricted to such heavy bombers as the Soviet Bear and Bison aircraft and the American B-52s.

Provisions were also made in the Treaty to limit the range of ALCMs deployed aboard heavy bombers to 2,500 km and to prohibit both the rapid reloading of ICBM silos and the storage of excess missiles at launching sites. To ensure compliance, the two parties were prohibited from transferring the weapons limited in the Treaty to third parties and were required to provide each other with necessary information regarding missile testing as well as the size and performance of their respective arsenals. They were also, of course, to desist from interfering with the national technical means of verification provided for in the Treaty.

It can be seen from the above historical outline that the SALT II ceilings were rather high. But, while the restrictions on qualitative improvements on weapons were inadequate and the Treaty did not fully take care of verification problems, it did—at least—allow some parity in numbers and reduced the chances of either side's acquiring first-strike capability. Moreover, apart from the Protocol, designed to codify the restrictions on weapons modernisation, SALT II's Joint Statement of Principles provided a framework for future negotiations.

It was generally thought that the next round of talks would be SALT III and that they would focus on Western Europe and on reductions in forces. For instance, the Soviet Union was reportedly already "pushing for recognition of the concept that American nuclear-capable aircraft in Western Europe (so-called forward-based systems, or FES) and allied strategic nuclear forces (the British and French SLBMs forces) be subject to limitation in a future agreement," while the Americans would want new qualitative limits in terms of research and development in addition to reductions in forces. Future negotiations could be anticipated to entail a discussion of the cruise missiles and the TU-26 as well as the British and French nuclear forces. The relatively new Soviet SS-20 issue would be raised and so would the entire NATO-Warsaw Treaty nuclear balance. The Soviet Union, however, was not likely to be forced to negotiate under the threat of possible American deployment of MX ICBM in any mode.

START, INF and Recurrent Problems of the Arms Control Negotiations

The United States failed to ratify a number of arms accords signed between 1974 and 1979. Today, some of the observations we made exactly one decade ago are still valid with regard to the problems involved in negotiating those agreements. The existing and recurring problems are all related to the pattern of negotiation and its underlying factors. These factors include the issue at stake and the procedure for carrying out any decisions reached in the negotiations.

SALT eventually gave way to the START and INF talks, which collapsed in 1983. At the talks, the United States considered strategic buildup and the deployment of Pershing II and cruise missiles in Europe. In spite of the Soviet Union's awareness of the sophistication of these systems, especially with regard to short warning time and unpredictable trajectory, the proposal put forth by the Kremlin's delegation did not go beyond requesting that the United States forego the submarine-launched cruise missiles (SLCMs). The Soviet Union was, of course, also interested in equal cuts rather than deep asymmetrical reductions in the relevant systems. And it was worried about the anticipated militarisation of space. While planning its own space-based systems and improving existing offensive arms and other strategic defence, the Soviet Union started raising objections to SDI, proposed by Reagan on 23 March 1983 as a comprehensive defence or "shield" to render strategic nuclear weapons obsolete. Indeed, the fear of "Star Wars" might have induced the Geneva agreement between Secretary of State George Shultz and Foreign Minister Andrei Gromyko. But, the shadow boxing continued and the circle of negotiations was later to be retraced.

The recurring problems of the arms control negotiations, therefore, derive from the American leadership's military-political thought and from Soviet official military-strategic planning. For both, nuclear weapons have become legal instruments for policy implementation— and this strategic posture of the two sides has become compounded by the problem of perception. For quite some time, many pressure groups in the United States have viewed the Soviet Union as seeking strategic superiority and the capacity to destroy American strategic retaliatory capacity through a pre-emptive or disarming first strike. To some, the appropriate response to this would be for the United States to improve its counterforce capabilities and develop mobile or multiple aim-point land-based missiles. Some reason that the United States might, in fact, need to deter the Soviet Union by ensuring stability through strategic force invulnerability, while others call for the production of far more sophisticated weapons, unknown before, so as to put an end to Soviet ambition to become a global military Power second to none.

Some members of the American Congress often regard any concessions in the negotiations as disastrous. For instance, they considered SALT II as leaving the mainstay of the American land-based nuclear deterrent—the Minuteman ICBMs—vulnerable by the early 1980s to virtual destruction on a first strike delivered by a fraction of the total Soviet missile force. It was also believed that the agreement would limit *(a)* the range of all cruise missiles (which, with the MX missile, represented the bargaining chip referred to sometimes as "the missile the Russians fear most") and *(b)* the number of long-range manned bombers, while ensuring that the Soviet Union would have at least twice as many ICBM warheads as the United States.

Moreover, the political forces within the United States that view the country as being short-changed through the arms control negotiations stressed that American land-based ICBMs would be vulnerable, and that SALT II would permit the development of Soviet air-defence systems, which could blunt the-effectiveness of the American bomber force, making the capacity for assured retaliation more heavily dependent on submarine-based missiles. But, a far more fundamental American perception was the feeling that American negotiators were being too eager to please and that the United States could soon be led into a position of strategic inferiority. And there were also those who believed (and many still do) that American participation in the negotiations had been predicated on the assumption that any treaty should stabilise the international strategic balance without placing the United States in an inferior position to the Soviet Union, and that it should allow the United States to maintain an intensive research, development and weapon-modernisation programme. In their eyes, the SALT II Treaty did not meet any of these requirements.

Apart from the mutual accusation of reacting negatively to proposals rather than showing initiative by offering proposals, the Soviet Union too, has its own unpleasant views of the negotiations. It is often irritated by some American leaders' public styles, which frequently cast the United States in the role of innovator and initiator, while portraying the Soviet Union as obstructing the arms negotiations.

Moreover, the Soviet side suspects and is doubtful about most moves made by the United States. For instance, it was the United States that introduced the MIRVs to destabilise existing weapons and planned the deployment of long-range cruise missiles for greater destabilisation of the system. Other Soviet resentments during the mid-1970s revolved around the American proposal for substantial reductions in deployment of land-based ICBMs—part of the backbone of Soviet military strength—including cutting by as much as 50 per cent their largest missiles already in place, and the fact that this proposal made no provision for reducing or restraining systems in which the United

States had an advantage, such as the Trident submarine or the B-l bomber. Moreover, the limitation proposed for cruise missiles was grossly inadequate from the Soviet perspective.

And so the problems became wider in scope. They went beyond issues relating to mutual suspicion, such as the problem of reconciling common ceilings and reductions. One of these problems was the so-called "gray area" issue or the dual-capable systems. These figure both in the direct United States-Soviet strategic relationship and in any assessment of balance in the European theatre. They include the United States cruise missiles and forward-based aircraft in Europe and the Soviet Union's Backfire bomber and some intermediate-range missiles like the SS-20. The problem here has been the significant disagreement over the definition of the mission of the weapons and whether or not to include them in the list that had, in the past, been limited to those capable of reaching the other side's homeland. Today, there is a new bargaining chip. SDI, designed to create either a space shield or insurance against retaliation for a nuclear first strike by the United States against the Soviet Union, has added its own complications.

Before the United States sought new leverage through SDI, an earlier expectation was that the negotitions would cover issues with which such forums as the Conference on Security and Co-operation in Europe (CSCE) were preoccupied. These include nuclear test bans and the search for parity of strength through symmetric reductions, the latter being advocated in the name of mutual and balanced force reductions. While any reduction to a common ceiling would mean greater reduction on the part of the Warsaw Treaty, it was still felt in some quarters in the United States that such agreements with the Warsaw Treaty could restrict NATO's future options, whereas, from the Soviet viewpoint, there would be political instability in Europe unless some rational restrictions were placed on Western military options. These suspicions and fears no doubt derive from some structural deficiencies in the two organisations, but they have become important factors in their perception of the strategic balance.

There is, finally, a recurrent problem of violations and inadequate means of verification. There have been allegations and counter-allegations of cheating. Each side claims that the other is *(a)* engaged in illegal construction of new weapons, *(b)* testing and concealing some weapon systems in violation of certain articles of the SALT agreement, and (c) blinding, i.e. obstructing, the photographing or monitoring of new weapons. All these contravene the commitment of both sides to non-interference with each other's independent means of verification, the national technical means of verification which were to be used in a manner consistent with generally recognised principles of international law. And, because these means include the blockable satellite-based sensors of various types used to monitor each other's compliance, ELINT (electronic intelligence) and other intelligence collection techniques and technologies whose processes could be impaired, there are many grounds for mutual suspicion. There has, therefore, been an urgent need for means that could not be easily intercepted. The danger of disinformation does not make the problem less complex—in spite of the SALT II Common Understanding not to impede verification through encryption of signals from missiles being tested as well as the recent agreement to go beyond national means of verification.

Moreover, the basic goal of the negotiations has been to ensure a reduction in the existing levels of nuclear weapons and to restrain the introduction of new systems so that the strategic balance is not destabilised. This goal cannot be attained without compliance and this, too, can only be ascertained through both national and non-national technical means of verification. With regard to the non-national means, each side is not likely to allow more than a few visits to test sites and selected installations. And, as has been observed, the existing national technical means are "vulnerable to measures that may *degrade* their assumed effectiveness, *interrupt* their functioning, or *prevent* their operation."

What then could sustain the negotiations and guarantee compliance with negotiated agreements? A logical answer would be to introduce the use of aircraft reconnaisance— since it would neither encounter any natural inhibitions (such as bad weather or darkness) nor follow a path and schedule in such a way that major weapons activity or strategic gadgetry could be concealed from it. This means (as part of the non-national) would not, of course, be acceptable for political reasons, and so the agreements could be abandoned.

The negotiations have therefore continued to afford the powers the opportunity to play the strategic game as if it were chess or backgammon. They have at the back of their minds the desire for armed strength to contain or deter the other. Their ultimate objective, however, is to win the game or strike a balance or draw, if winning becomes impossible. Winning, in this case, implies strengthening or enhancing one's strategic position relative to the opponent's, while a draw means leaving the relative positions substantially unaltered.

Willingness to play the game (negotiate) is generated by some compulsion.

Another look at the salient issues involved in the negotiations would confirm the points above. For instance, "strategic parity" has become almost a creed. While MIRV deployment might not be affected, numerical parity would allow the United States to build an ABM system approximately as big as that around Moscow, while the Soviet Union could increase its submarine missile force several times over. This development could lead—on either side—to such an expansion of long-range bomber forces (with newer aircraft) that the essence of parity could be nullified. Each side is aware that effective negotiations require rough parity of forces. One implication of this is that the European balance (both nuclear and conventional) should not be handled within the context of the Vienna Talks on Mutual Reduction of Forces and Armaments and Associated Measures in Central Europe, which cover only the central front. Instead, the Super-Powers should ensure that it is taken up by a new group comprising the 35 signatories of the 1975 Final Act of the CSCE. This would allow greater attention to be focused on the area stretching from the Atlantic to the Urals in the discussions on nuclear overkill.

Bureaucratic politics or technological imperatives have also introduced some factors into the negotiations. The bargaining chip is one such factor, and it can hardly enhance trust or be effectively kept clear of projected force postures. Let us take the ABM Treaty, for instance. It is a classic example of a bargaining chip. It's not wanted and not needed, but one negotiator thinks he must have it so that he can give it away in exchange for another bargaining chip which the other did not want and did not need but acquired for the same purpose. Before Reykjavik, the blackmail revolved around the militarisation of space. The situation now seems to have altered slightly.

Moreover, the environment of the negotiations also tends to compound the problem. Both sides have domestic constituencies with their peculiar problems. To sell any agreements to these constituencies they have to convince them that the men on the other side are reliable negotiating partners and that they themselves can remain tough.

The Super-Powers demonstrate adequate awareness of the need to restrain the strategic arms competition, but they are not prepared to suppress threatening technical developments or prevent the dangerous qualitative improvements in strategic forces. They tend to prolong the negotiations through piecemeal measures, if only because they want to prevent a return to the cold war or are, in fact, not sure of the true status of their relative capabilities.

In spite of the "progress" made after many years of negotiating agreements and some co-operation in areas where there is continuing risk of inadvertent conflict, the two sides really do not have the full facts before them to guarantee meaningful and permanent agreements and there is no law to ensure that they will get them. For instance, despite United States claims that the Soviet Union got more than it did from SALT II, did the United States make any distinction between the Minuteman II (which carries a single nuclear warhead) and the Minuteman III (which can carry three MIRVs)? And is the Soviet Union sure how many warheads would be put on the Minuteman III? Yet, there was the common fear in the West that its ability to deter Soviet attack was failing at all levels—conventional, theatre nuclear and strategic. The United States consequently launched the MX missile in California in June 1985. The Soviet Union was not, however, going to remain idle until the formal deployment of the American MX force, which, with its 200-missile and 2,000-warheads, was expected to be able to destroy all the Soviet Union's land-based missiles in a first strike. In other words, technical advances in weaponry and the possible inclusion of some new issues and parties are seen as likely to further complicate the problem of classification at the negotiations. This is all the more likely since a Soviet General and an American General do not see the military situation the same way and are not likely to agree on what is equitable. But, Reykjavik has, at last, added a new dimension.

Reykjavik's Zero-Zero Option

Reykjavik has come as an unusual, but timely, development. So much hope had been placed on the Geneva summit of 1985, which produced so little. Indeed, apart from the symbolism of the summit and the pointer it gave to the future, there was nothing else that was reassuring about the future of arms limitation and disarmament. There was, of course, an American-sponsored resolution in the First Committee of the General Assembly calling on all States to recognise the overriding importance of compliance with arms limitation and disarmament agreements, which was adopted without a negative vote. The resolution recognised the fact that any violation of compliance with arms control agreements affects both the security of States party to them and that of other States relying on constraints and commitments stipulated in the agreements. But, the resolution could only call on the countries that have signed disarmament agreements to fully live up to their provisions and could not compel the Soviet Union and the United States to continue talking at the bilateral summit until the arms control issues on their agenda were resolved. Yet the achievements of the two Super-Powers in this regard would dictate the course and consequence of the arms race. And this is why Rejkjavik roused such great hopes.

The policy reformulations and initiatives that one has observed in Gorbachev's administration seem to have been carried to Reykjavik. There we saw a recast of Soviet positions on INFs—a far cry from the November 1983 episode—a new Soviet perspective on the Atlantic alliance and an overall commitment to make concessions. Back in January 1986, Gorbachev had launched some comprehensive proposals which included the complete elimination of nuclear weapons by the year 2000. This was to be followed by the removal of tactical and short-range missiles. And, because of the Americans' constant desire to establish linkage between their perception of Soviet strength in land-based nuclear weapons and the usefulness of the United States SDI in the offence-defence equation, Gorbachev had (at the June 1986 meeting of the Political Consultative Committee of the Warsaw Treaty in Budapest) proposed that the negotiating zone be from the Atlantic to the Urals, phased troop reductions (of 100,000-150,000 troops within two years and up to 500,000 soldiers and airmen by the early 1990s) and cuts in tactical nuclear aircraft and nuclear weapons with ranges of over 1,000 kilometres.

The foregoing were reflected in Reykjavik, where General Secretary Gorbachev appeared quite ready to accept substantial cuts in Soviet missile forces in exchange for American agreement to abide by the ABM Treaty for 10 years and confine SDI research to the laboratory. In President Reagan's view, the United States would need SDI to provide a defensive shield against any offensive nuclear forces—some deterrence more or less in the tradition of "mutually assured destruction" (MAD).

At the end of the Reykjavik summit, the Super-Powers agreed to halve strategic offensive weapons during the first 5 years of a 10-year period. They also agreed on a reduction to 100 warheads on medium-range missiles in both the Asian part of the USSR and the United States own territory, zero medium-range missiles for both sides in Europe and a freeze on the existing number of short-range missiles deployed there.

In short, the Americans had less cause to worry much about the long-dreaded SS-18s with their accuracy, speed and destructive capacity and other large Soviet multiple-warhead ICBMs. Efforts were also made to restrict both sides to weapons that lack first-strike capability-cruise missiles, bombers and the small single-warhead mobile ICBMs that are designed essentially for retaliation. While something has been gained at Reykjavik, the problem remains how to fully reconcile the American desire for reduction in what they classify as offensive forces with the Soviet interest in restraining such high-technology means of destruction as space strike arms which the Americans see as part of their defensive systems.

For now, at least, the Super-Powers have agreed to some form of zero option, which means withdrawal of the intermediate-range missiles that threaten Europe. The proposal to ban all ballistic missiles within 10 years could also help the cause of arms control and the search for global peace through disarmament. But, the two leaders need to be faithful to the spirit of the negotiations and also work hard to convince powerful groups within their national and global constituencies. With improved relations with China (the cultural and economic agreements signed during the past two years should pave the way) and some flexibility towards Japan and the West, it would be possible to allay the fears (especially in Britain and France) that any Soviet-American nuclear deal could become devastating to Western Europe's nuclear deterrents. While anti-nuclear sentiment is running deep into the heart of Europe, official promoters of strategic linkage are also at work, lobbying against any "comprehensive compromise" that would promote peace but threaten their purse. This is why the world has been witnessing conflicting interpretations of Rejkjavik, especially at official levels, as in the November 1986 discussions on arms control between American Secretary of State Shultz and Soviet Foreign Minister Shevardnadze and in the nuclear and space talks in Geneva.

Future success will depend on a number of factors. The arms control negotiations have usually been viewed simply as the continuing negotiations between the United States and the Soviet Union on the issue of limiting and reducing strategic nuclear weapons. But, the negotiations are broader than this in terms of scope and implications. The proximate goal is, of course, the stabilisation of the relationship of mutual nuclear deterrence between the Super-Powers. But, the broader implications suggest:

(a) The possibility of antagonistic States collaborating on the control of nuclear weapons;

(b) The likelihood of achieving a demilitarised international society in which nuclear war would become less likely;

(c) The probability of halting nuclear proliferation, vertically and horizontally;

(d) The practicability of formally reducing the risk of nuclear war through specific treaties.

The points noted above suggest that while the arms control negotiations could promote objectives that are primarily bilateral, they have universal implications as well. Their purposes are indeed universal in that they entail reductions in the arsenals for killing or maiming people who are not necessarily Soviet or American citizens. They have also been motivated by certain political and economic reasons, whose essence and spill-over effects bear upon the structure of the international system. Indeed, the potential of the negotiations goes beyond merely restricting the competition between the two nuclear Super-Powers and setting a limit to the superiority they have over other nations. The negotiations are based in part on the prevailing strategic situation of the international system and on—in the words of the preamble of the ABM Treaty— "the premise that nuclear war would have devastating consequences for all mankind". The nature of the negotiations as international phenomena requiring international agreement is reinforced by the realisation that seeking an end to vertical proliferation by the Super-Powers is a necessary condition for halting horizontal proliferation among the potential nuclear powers.

On the whole, the history, patterns and problems of the arms control negotiations attest to the fact that the two Super-Powers and the rest of the world—especially Europe—which constantly hinder rather than help the talks with their strategic policies are to blame for the lack of decision to move towards a complete ban on the production of nuclear weapons and their elimination. This is the dilemma before us and it must be faced squarely. Negotiations remain the principal means of resolving the inherent and recurring problems, but their success depends on the goodwill and political will of the parties involved. There is need for compliance with the principle of equal security and a genuine appreciation of the nuclear danger to the world. The march towards arms limitation and global disarmament and a meaningful halt to the nuclear-arms race can therefore be achieved only through increased pressures by international governmental and non-governmental organisations as well as national groups and associations, and with the participation of all nuclear powers (and some non-nuclear weapon States as observers) in negotiations on ending the production of nuclear weapons and on eliminating their stockpiles.

REYKJAVIK AND THE PROSPECTS FOR A NUCLEAR FREE WORLD

Political analysts, diplomats and politicians have come to regard as natural the linkage between Reykjavik and prospects for a radical reduction in nuclear arms. The meeting in the Icelandic capital marked a turning-point in the search for a conceptual approach to and a practical solution of the crucial problem of today, namely, the elimination of nuclear arms. The meeting owes its significance primarily to the fact that the leaders of the two powers possessing the world's largest nuclear arsenals discussed in concrete terms the ways to implement deep cuts in their arsenals and almost succeeded in elaborating a diplomatic formula that could produce agreement.

In this respect, Reykjavik was no accident. In fact, it crowned the long-standing efforts of those who advocate solution of the problem of nuclear overarmament—initially through reducing the nuclear capabilities of the Soviet Union and the United States. The intellectual breakthrough in Reykjavik reflected the awareness—at least on. the Soviet side—that a higher level of nuclear confrontation could at some point diminish military-strategic stability instead of enhancing it, even if parity were strictly maintained.

For that key conclusion to be made, we had to review analytically the traditional approaches to and established notions about peace and security. In other words, we had to apply new thinking to the major issue of our times. In the process of sorting out outdated dogmas and stereotypes, we arrived at two fundamental conclusions. First, in terms of the supreme interests of survival, the world is one, notwithstanding its diversity. Compared to all other class, bloc or national interests, the task of preventing nuclear war holds absolute primacy. Secondly, the security of any State would be greater if it abandoned attempts to diminish the security of the other side. In other words, in terms of the Soviet-United States relationship, the Soviet Union has no interest in seeing United States security diminished, as this would stimulate a dangerous arms race and lead to dangerous instability.

Unfortunately, however, many people in the West tend to regard such a decisive turnabout in the established approach as heresy, inconsistent with the way of thinking that is generally accepted, not because of its inherent logic, but only because it has been so long and so blindly held in awe. Apparently this is also due to the fact that progress in physics and military technology has overtaken progress in political thinking.

In practical terms, Reykjavik continues to exert an effect in that the ongoing talks on strategic offensive arms, medium-range missiles, and the strengthening of the anti-ballistic missile (ABM) Treaty regime (which the two sides agreed not to withdraw from for at least 10 years) are proceeding on the basis of agreements and understandings reached there between the leaders of the Soviet Union and the United States, despite remaining differences. The USSR does not retreat from the parameters discussed there and is ready to travel its part of the road towards the implementation of what was discussed in Reykjavik.

What are the difficulties standing in the way of treaties and agreements on nuclear disarmament?

First, as Mikhail Gorbachev noted, the main obstacles are of a political nature. This is a matter of political will, a matter of intentions.

Secondly, military and political concepts and doctrines of the 1940s and 1950s prevail in the West. They are built either on the misconceptions arising from the West's short-lived nuclear monopoly and nuclear-missile superiority or on a deification of nuclear weapons as supernatural peace-keepers. The doctrine of flexible response is nothing but a camouflage for claiming a right to deliver a first nuclear strike. A potential explosion is inherent in the concept of nuclear deterrence, a concept which is being ripped apart by internal contradictions. One cannot say that a nuclear conflict would be a catastrophe for all of us and argue a moment later that nuclear weapons should be retained as a means of preserving peace.

Thirdly, it is the persistent desire of some of our negotiating partners to strengthen their security at the expense of others rather than together with them. Hence, endless tactical fuss and attempts to drown agreement in linkages and reservations and to gain unilateral advantages.

Fourthly, there are efforts to ensure security by military and technological, rather than political, means, that is, through pursuing the arms race and opening up new channels for it. A concentrated expression of these attempts today is the SDI programme.

Fifthly, there are the obstacles of a psychological nature which manifest themselves first and foremost in cultivating an image of other peoples as the enemy, in exaggerating the differences in States' political systems and policies, and so on. Moreover, weapons and fear and weapons and mistrust are communicating vessels that feed each other.

In these circumstances a logical question arises: Is the Soviet Union's goal of building a nuclear free world realistic at all? We answer this question in the affirmative.

People tend to view ideas that are in advance of contemporary thinking as Utopian. However, if experts could study closely the programme of a nuclear free world formulated in detail by Mikhail Gorbachev in his statement of 15 January 1986, they would see for themselves that this programme is fair and pragmatic in every aspect. If the United States or other countries desire to make a contribution of their own to the further development of this programme, they are welcome to do so.

What proves the feasibility of plans to drastically cut nuclear arms and later, at a certain stage, to eliminate them? While laying no claims to give an exhaustive answer, we would mention several factors which, in our view, prove that the nuclear disarmament programme is feasible.

(a) The nature of proposals to this effect advanced by the Soviet Union are specific and balanced in character. The phased implementation of reductions deserves special mention. The concept of a phased approach incorporates the principle of maintaining stability and balance at progressively lower levels of confrontation. This is true of our proposals on strategic offensive arms, medium-range missiles and nuclear explosions.

(b) Significant progress has been made in dealing with the issue of verification of the reduction and elimination of nuclear weapons. One can say today that the number of points of convergence on this key element of the process of real disarmament has increased significantly. A solid basis for productive negotiations exists.

(c) An entire system of confidence-building measures is already in operation in Europe and has been further elaborated for other regions, in particular for Asia. The decisions taken at Stockholm have contributed to progress in the field of disarmament.

(d) The very size of the arsenals that have been built up—about 25,000 nuclear weapons on strategic delivery vehicles alone—demonstrates that overarmament has reached a level that argues convincingly in favour of practical reduction.

(e) Sufficient advance has been made in developing the theoretical and conceptual basis of nuclear weapons reductions, in particular as an essential element in strengthening strategic stability.

The USSR deems it advisable to approach the solution of security and strategic stability problems on a wide front, covering—apart from nuclear arms—conventional and chemical weapons, the strengthening of the regime of the treaties in force and the prevention of an arms race in space.

What measures can be taken in the short-term and medium-term perspective? A realistic possibility at present would be the elaboration of a treaty on medium-range and operational-tactical missiles. The importance of such an agreement stems from the fact that it would rid Europe of an entire class of nuclear missile systems. Furthermore, certain of its aspects (e.g., verification provisions) could serve as a useful precedent for working out subsequent agreements on the reduction of other types of nuclear arms. A medium-range missile treaty would be the first practical and constructive step towards this goal.

The questions of reducing strategic offensive arms and preventing an arms race in outer space are more complex. But, in this case, too, we believe it will be quite possible to agree on the key provisions of future accords in the next few months. Naturally we are also prepared to conclude complete treaties on these questions. As Mikhail Gorbachev has noted recently, the most important task at this moment is to preserve the ABM Treaty. Should the Treaty be violated, the negotiations would lose their value, the arms race would get out of control and suspicion and mistrust would grow. If, on the other hand, the ABM Treaty is preserved and strengthened, new vistas will open for rapid progress in the remaining years of the decade and the 1990s towards a nuclear free world.

What is our vision of a nuclear free world? As early as the beginning of the 1990s, we could rid Europe of both medium-range and operational-tactical nuclear missiles. As to the nuclear systems still remaining there and a limited number of nuclear warheads on medium-range missiles deployed in Asia and in United States territory, we feel that they should also be included in the agenda of subsequent negotiations. The problem of tactical nuclear weapons would be addressed concurrently with armed forces and conventional arms reductions.

While eliminating in Europe a dangerous concentration of nuclear arms deployed in the zone dividing the two politico-military alliances, the United States and the Soviet Union would also cut their strategic offensive arsenals by 50 per cent within a five-year period, provided, of course, that the ABM Treaty remained in effect and that all attempts to break the existing structure of Soviet strategic potential were abandoned. Later on, agreement should be sought on a phased elimination of the remaining strategic offensive arms.

During the first stage in the process of radically reducing and eliminating nuclear arms, the two sides would gain some valuable experience in the application of procedures, principles and mechanisms related to mutual verification, which, in turn, would serve as a factor ensuring security. The Soviet Union stands for the-strictest possible verification, including inspections of facilities where missiles are to be dismantled and destroyed, test ranges and military Bases, including those located in third countries, and plants and depots, both government-owned and private.

It would be extremely important to compare the military doctrines of NATO and of the Warsaw Treaty and to examine how they might evolve in the future. This would dispel mutual suspicion and distrust, while making military doctrines and concepts fundamentally defensive.

In accordance with the Soviet-proposed concept, all disarmament and confidence-building measures should lead in the long run to the establishment of a comprehensive security system in the political, economic and humanitarian fields. This is the multi-layer structure we envisage that should serve as a basis of a nuclear free world.

POSSIBILITIES AFTER REYKJAVIK

The subject of this meeting takes Reykjavik as a point of departure, and rightly so. Obviously, no miracles happened at Reykjavik. Miracles rarely happen at summit meetings. At the same time, what did happen at Reykjavik was not totally unexpected. The main themes had been around for years. It is also true that great discrepancies arose immediately after Reykjavik about what really happened there, about the exact degree and substance of the convergence of views that was on the brink of being achieved.

Notwithstanding all that, it has to be recognised that Reykjavik has come to be regarded, rightly or wrongly—and I think rightly—as the beginning of a new era in the arms control and disarmament field. It is seen as a breakthrough, as a hopeful sign that a world free of nuclear weapons need not always remain an illusion or a goal to which politicians pay lip service from time to time, without any realistic possibility of ever being attained or, at least, achieved in the foreseeable future. The position of the third world regarding nuclear weapons is too well known to require repetition here. Governments and peoples share a total rejection of those instruments of mass destruction. In the developed world, the situation is not the same. It is a fact that one of the two great military alliances bases its defence policy on nuclear deterrence, but, at the same time, I think it is also a fact that the great majority of the population of the West is completely against nuclear weapons. The other military alliance is on record as favouring a no-first-use policy, but nuclear weapons are an important part of its arsenal and it has been asserted that it practises, without officially saying so, a policy not very different from the one followed by its rival. In any case, the danger of a nuclear war is always present, and its consequences have been described too many times for the words "a nuclear war cannot be won and should never be fought" not to meet with universal approval.

It was somewhat distressing, therefore, at least from a third world point of view, that the results or, to be exact, the possibilities opened at Reykjavik were received with reservations, sometimes with strong reservations, in certain circles. No treaties were signed at Reykjavik, nothing was really agreed to, but the mere possibility of making great advances towards the elimination of whole categories of nuclear weapons was enough to cause great concern, even in quarters not often associated with hard-line attitudes or with distrust about arms control in general.

Some hoped, it seemed, that Reykjavik would just go away. The linkage between nuclear missiles and SDI made possible—fortunately, in their opinion—any agreement. World leaders were saved from their own thoughtlessness. Nuclear weapons and their means of delivery would remain untouched and would continue to be the guardians of peace and security.

But, unhappily for those who thought along those lines, Reykjavik did not fade away. What was discussed there were not just political manoeuvres or propaganda tricks without real content. The Soviet Union has dropped the above-mentioned linkage related to SDI. Important reductions in the number of nuclear warheads and means of delivery seem to be under way. Long-range intermediate nuclear forces (INF) in Europe could be completely eliminated. Both sides agree to the zero option. Up to 100 missiles will remain in Asia and 100 in the United States, outside Europe. The short-range intermediate nuclear forces, regarding which one side is said to enjoy a 9-1 advantage, were also thrown into the package. They could disappear too. A Europe free of nuclear weapons seems a goal that could realistically be achieved in the near future, not an illusory mirage.

Two major difficulties seem to face this grand design. One is natural and logical. Verification is an indispensable and fundamental component of any disarmament agreement—not just any kind of verification, but an efficient system of verification, to the satisfaction of both sides. One side should be reasonably sure that the other side does not cheat. The word "reasonably" should be underlined. A system 100 per cent perfect just does not exist. To try to reach the unattainable is to deny the possibility of ever getting disarmament agreements. On the other hand, a country which has historically always been very reluctant to accept verification measures that it has considered "intrusive" seems now to be changing that attitude. The field is open, therefore, for an honest and earnest effort to arrive at verification procedures which will ensure that an agreement or agreements to make Europe free of a whole range of nuclear weapons can be trustworthy and politically acceptable. The difficulties and obstacles which will arise should not be minimised, but if there is a will, they should and will be overcome.

The other problem which stands in the way of an INF agreement is of a different character. Two assumptions are made: (a) Western Europe's security depends on the American nuclear umbrella, which will be seriously if not essentially affected by the elimination of INF; *(b)* nuclear weapons are indispensable to Western Europe's security because the Warsaw Treaty countries enjoy an enormous superiority in conventional weapons.

The absence of INF in the European theatre would diminish somewhat the options open to NATO to apply the doctrine of "flexible response". Some of the flexibility would be gone, true, but Western Europe would continue to be protected by nuclear weapons, particularly intercontinental ballistic missiles based on American soil and sea-launched missiles—not to mention the British and French nuclear forces, which will not be directly affected by any United States-USSR INF agreement (in another positive development).

The superiority of the Warsaw Treaty's conventional forces over NATO's has been mentioned time and time again, almost always by Western sources, in explaining or justifying the need to rely on nuclear weapons for the defence of Western Europe. It is raised now as an additional argument to oppose, or at least question, the advisability of totally renouncing INF in Europe. In that case, it is argued, Western Europe would be at the mercy of the East and its independence and full sovereignty would disappear, if not by an outright invasion, little by little because of irresistible pressures.

I think the time has come to deal squarely and forcefully with this issue. The need to eliminate nuclear weapons from the European theatre does not obviate the need to also deal with conventional forces.

Conventional weapons do kill too, and terribly so. I hope I will not be misunderstood if I say that we, in the third world, tend to look at conventional weapons in a different light, not because to die from a bullet wound is better than to perish in a nuclear exchange, but because the consequences of a conventional war do not affect other regions of the world, as a nuclear holocaust obviously could.

Conventional forces in Europe should not remain outside the effort to increase security in Europe. On the contrary, they should be an important element in that effort. But, there should not be any linkage between conventional and nuclear forces.

Even the assumption of Warsaw Treaty superiority is open to question. The matter has been studied many times and the answers differ greatly. Some agree that one side has a great advantage over the other; others recognise superiority in some fields but not in others; others, finally, state that the forces of NATO and the Warsaw Treaty are comparable. Whatever the correct answer, if there is one, it seems fair to assess that, at present, Western Europe possesses enough conventional forces to deter a Warsaw Treaty attack, even conceding a certain superiority of the latter in several aspects. But, of course this assessment is also open to question.

The conclusion, at least of this author, is that the conventional forces argument, whatever its merits, should not, must not, be used to oppose or to put obstacles in the way of an INF agreement. We are talking about INF in Europe, and we certainly recognise the right of European Governments to take the position they consider appropriate to safeguard the security of their own countries. That right cannot be challenged. At the same time, we cannot ignore the fact that what happens in Europe, the region with by far the most nuclear weapons, has enormous repercussions on the rest of the world. Two world wars in this century originated in Europe. The most likely place to witness the beginning of the third would also be Europe, but with a difference: there would probably be no one to witness the end of that war.

A Europe free of nuclear weapons or on the road to such a fortunate situation would, of course, be of paramount importance to Europe—and also to the rest of the world. We hope that agreements to that effect will be reached in the near future. We know that the problems and difficulties are many, but they can be surmounted. There is no need to add new ones. Most of all, reliance on nuclear weapons should diminish; those regions which have them should learn to live in peace and security with fewer and fewer of them and not to panic when there is a chance to decrease their numbers. The agenda in the field of arms control and disarmament is wide and of tremendous significance. Nothing, or very little, of importance has been done on these questions in recent years, but now Reykjavik has opened new possibilities. Let us not miss them. The possibility of a cessation of nuclear tests calls for a strong and earnest effort to reach an agreement which is long overdue. The question of the prevention of nuclear war, which could be tackled from different angles, awaits serious treatment in the Conference on Disarmament. The bilateral negotiations in Geneva should be pursued in good faith, with the political will to get things done and to advance towards goals convenient and attainable. The 1990s must be a time of successes. We cannot afford failures.

In the last instance, we always return to the same question: Do we want or do we not want a world with nuclear weapons? Almost all mankind has already given a negative answer. The leaders of both Super-Powers, possessors of the most powerful nuclear arsenals, have accepted as a worthy goal the complete elimination of nuclear weapons. The possession of nuclear weapons by anybody (besides, of course, those who already have them) is considered evil and a threat to international peace. The whole non-proliferation policy stems from that assessment.

On the other hand, some countries seem to consider them a good thing, a legitimate means of defence, a guarantee of peace. It does not seem to matter if they hold the rest of the world hostage, if they compel everybody to live with the permanent risk of nuclear devastation, as long as they consider their security protected.

No disarmament or arms control agreement is possible without some risks. That is a fact. Agreements without risks just do not exist. Nobody asks anybody to take unreasonable risks. But, it is not reasonable to miss historic opportunities, when so much is at stake. It is not reasonable to dwell only on the risks and disregard the advantages that could follow from a nuclear agreement, not only for the region concerned, but for the whole of international society. If the obstacles prevail, one has the right to question if there really exists a true commitment to the reduction and eventual abolition of nuclear weapons.

The hopes and aspirations of the great majority of the world are well expressed in the message that the leaders known as "The Six" addressed to the Heads of Government of the United States and the Soviet Union at the end of 1986:

> "However, the Reykjavik meeting demonstrated that it is possible, given political vision and commitment, to go beyond old doctrines and to break new ground in nuclear arms control and disarmament. It is heartening that the proposals from Reykjavik are still on the table and have not been withdrawn. 1987 therefore provides an opportunity for the Soviet Union and the United States to agree on a number of important disarmament measures, including deep cuts in nuclear arsenals. We urge the leaders of these two nations to take advantage of that opportunity and to build on the understanding of Reykjavik, without any weakening of the commitments made there. As long as agreement is not reached, the nuclear arms race will ineluctably continue to escalate and the survival of all of us will become more and more precarious."

A few days ago, The Six, recalling their first statement, issued three years ago, on 22 May 1984, said:

> "Today, we make an appeal not to jeopardize the opportunity to start a process of nuclear disarmament.... *Disarmament negotiations are now at a crucial point....* An agreement to eliminate all intermediate nuclear forces from Europe would be of considerable significance and would constitute *the crossing of an important psychological threshold...* For too long, fear and mistrust have prevented progress in disarmament. Arms and fears feed on each other. Now is the time to break this vicious circle and lay the foundation for a more secure world. *The present momentum should not be lost.*"

NUCLEAR WEAPONS AND INTERNATIONAL SECURITY

Earlier speakers today referred to the encounter between President Reagan and General Secretary Gorbachev at Reykjavik in October 1986 as if it had been some kind of breakthrough in nuclear-arms control. The reality is different and it is not much use putting a gloss of success over what was nothing short of a fiasco.

That the meeting was a dismal failure is borne out fully by the testimony of the participants. Secretary of State George Shultz repeatedly described Reykjavik as a "disappointment", adding on one occasion that President Reagan was right in walking away from the meeting. Donald Regan, then White House Chief of Staff, said at the Keflavik airport: "the Soviets finally showed their hand; it showed them up for what they are.... there will not be another summit in the near future as far as I can see". From the other side, General Secretary Gorbachev himself stated to the Czechoslovak paper Rude Pravo: "We have not moved an inch closer to an arms reduction agreement despite the efforts made by the USSR."

In his speech on the Soviet television on 22 October 1986, Mr. Gorbachev described the results of Reykjavik as comprising two half-truths: the first half of the truth, he said, was that nuclear disarmament was possible and that the leaders had agreed on the complete eradication of strategic weapons and the eradication of medium-range missiles in Europe. The other was that American insistence on proceeding with SDI had prevented the Super-Powers from reaching a meaningful agreement. Two half-truths seldom add up to a whole truth; the sum in this case is that the nuclear-arms race is about to enter outer space and the one worthwhile existing nuclear-arms control agreement, namely, the anti-ballistic missile (ABM) Treaty, is in jeopardy.

In a sense, outer space is already militarised; 90 per cent of the more than 2,000 satellites orbiting the Earth have military uses. But, the projected deployment in outer space of battle stations carrying lasers, beam weapons and other nuclear and non-nuclear engines of war will be a very different thing qualitatively, and it may wreck the last chance of bringing the nuclear-arms race under control and ending it. I am reminded of a phrase used by Colonel General Nikolai F. Chervov of the Soviet Union to describe the situation: "Mankind", he said graphically, "will race itself into a trap".

A number of developments since Reykjavik indicate a hardening of attitudes on both sides. For example, the Soviet Union has given up its unilateral moratorium on nuclear tests. It is difficult to blame that country, for its unilateral stoppage of tests did not evoke from the United States and other nuclear weapon powers a constructive response. The ending of the Soviet moratorium is nevertheless a setback. The United States abandonment of SALT II is even more disconcerting. Although the SALT II agreement, the result of prolonged negotiations, had never been ratified, for almost a decade both the United States and the USSR had adhered to the limits it stipulated. Unilateral American abandonment of SALT II cannot but be a blow to international nuclear-arms control efforts. Finally, the United States has carried out a couple of tests of SDI components which can only be considered as violations of the ABM Treaty—and that does not bode well for the future.

SDI is no longer a mere research programme in search of justification and funds; it is already under way, and efforts hastening the deployment of its early phases should not come as a surprise. In the grim picture of nuclear confrontation between the two great powers, that prospect is nothing short of a strategic calamity. Before SDI, the two nuclear giants had managed their confrontation within the framework of shared strategic doctrines: deterrence, mutual assured destruction, stability, and so forth. They are flawed doctrines, but since-they were shared by both sides, there was hope that the Super-Powers would work together to curb and reverse the nuclear-arms race. Now, under the impulse of technology, one side has unilaterally effected a change of strategy which is bound to cause alarm to the other and set it off on a search for countermeasures. The nuclear-arms race will be stepped up giving rise to fresh tensions and dangers.

The ABM Treaty quite clearly prohibits testing, development or deployment of ABM systems or components which are space-based. The language of the Treaty is simple and straightforward and only one interpretation of it is possible—the straight and narrow one. That was the view, too, of the United States Government until October 1985. Indeed, it was on the basis of that interpretation that the United States Senate had approved ratification of the Treaty, as Senator Sam Nunn, Chairman of the Senate Armed Services Committee, has asserted in Washington. In the words of Gerard Smith, one of the gentlemen who negotiated the Treaty, "Any different or new reading of its meaning would make the ABM Treaty a dead letter". In these perilous times, do the great powers of the day wish to proceed in their dealings with one another by violating the few laboriously negotiated past agreements?

I came of age with the explosion of the first nuclear bomb, in 1945. In these last 42 years, I have witnessed many shifts of power from one country or one part of the world to another. The lesson of the history of these four decades is that the condition of advantage in nuclear prowess, if it exists at all, is an entirely transient one, and in the race of nuclear arms, nothing that one side can achieve is beyond the other's reach for long.

Lt. General Daniel Graham of the United States has told us that SDI is a change of strategy and that his country will go ahead and deploy strategic defences. If the experiment succeeds and the Americans conclude that in the event of an attack they can defend themselves against a certain percentage of Soviet missiles, they will reduce their own offensive missiles by that percentage. The Soviet Union, the General added, can then start reducing a similar number of its strategic missiles. This sounds like a tale from the times of Rome and Carthage. In the nuclear age, I am afraid there is no way one great Power can impose arms reductions on another.

In the face of the American SDI, the Soviet Union, until such time as it is in a position to deploy equivalent strategic defences of its own, is left with but one option: to steeply increase its stockpile of offensive missiles. Highly placed Soviet authorities have said so on many occasions. Many Americans also concede that in similar circumstances this is precisely what they would do. Clearly, we cannot have both "Star Wars" and nuclear-arms control; the two simply do not go together.

In the last three or four decades, the world has missed many opportunities to reach genuine nuclear-arms control agreements. In the early 1960s, for example, a real opportunity of achieving a comprehensive test ban was allowed to slip and nuclear arsenals expanded as a result. In the early 1970s, the American decision to produce and deploy MIRVS (multiple, independently targetable re-entry vehicles) introduced a qualitative change into the nuclear-arms race and the stockpiles grew further in size and sophistication. We are at a similar juncture now, and SDI could lead to a doubling or tripling of stockpiles in a decade.

Between them, NATO and the Warsaw Treaty account for some 60,000 nuclear warheads. There is a concentration of some 15,000 to 20,000 of these engines of doom in the densely populated and comparatively small sub-continent of Europe. It occurs to me that the number of nuclear weapons in battle array in and around the European theatre is almost as great as the number of tanks of NATO and the Warsaw Treaty in the same theatre. This latter is estimated at around 23,000.

What has brought the world's leading powers to this—that they treat weapons of doom at par with the more conventional wherewithal of war? What are all these nuclear weapons for? Whom will they defend and what national interest can their use possibly serve?

Last year, a picayune nuclear mishap at Chernobyl was said to have contaminated milk supplies in far away California. Imagine the effects on Western European populations of the detonation, over Soviet territory, of 100 or more American strategic warheads. What would those detonations do to milk supplies in the United States? It might make for some nuclear sanity if our strategic planners were to have some objective studies made of the boomerang effects, on the perpetrator itself, of a sizeable nuclear first strike, no matter in which part of the world.

We must seriously examine the military role of nuclear weapons. We must examine, too, the impact of weapons that cannot be used in war on international politics and security. The truth is that this ultimate weapon has radically altered the nature of warfare. It has made war unthinkable not only militarily and morally, but also biologically.

But, great and powerful nations continue to produce these weapons to accommodate new advances in technology and also, perhaps, to respond to economic and industrial pressures at home. They then use them for psychological warfare against one another and against the rest of the world. They use them, too, as bargaining chips in arms control negotiations, which results in the magnification of the arsenals and in fresh complications in the negotiations. Technology is no longer an instrument of policy; it has become a substitute for it.

No nuclear exchange could make the least contribution to Europe's defence, and it is impossible to think of an exchange between the East and the West which would not cause unimaginable loss of life and property in Europe. And yet NATO's war strategies are based on the option to initiate a nuclear exchange and, as I mentioned, it is in and around Europe that there is the largest concentration of nuclear weapons. At what level would human society survive a nuclear exchange in the area?

The medical profession has informed the world that there would be no medical aid available after a nuclear exchange. Scientific opinion is divided: some think that the phenomenon of nuclear winter, brought on by a moderate exchange, would obliterate life in large parts of the Earth: others are of the view that human life would survive even a substantial exchange. The world's economists have yet to speak: they should tell us what kind of economic depression would follow a nuclear exchange in Europe and whether the economy could recover. I suggest that the United Nations Secretary-General set up, as a preparatory measure for the third special session on disarmament next year, a representative group of economic experts to prepare a report on the possible impact of a nuclear exchange on the economies of Europe, the United States, the Soviet Union and the rest of the world.

Of the many myths and fallacies propagated by nuclear strategists, there is none more foolish in my view than the one that couples Europe's defence to the nuclear clout of the United States. It may have had some validity when the United States was the sole possessor of nuclear weapons, but once the Soviet Union acquired retaliatory nuclear capacity, Washington's guarantee of Europe's nuclear defence ceased to have any meaning or credibility. Charles de Gaulle was the only European statesman to perceive and acknowledge this reality. He said in the 1950s that no American president would initiate a nuclear exchange to protect Hamburg, Brussels or Paris, because it would invite retaliatory attacks on Chicago, Los Angeles or New York.

It seems to me that the very premise of plans for the nuclear defence of Europe is false, that is, it is incorrect to assume that the Soviet Union is hell-bent on conquering Western Europe and that an onslaught of Soviet armies could be resisted only by nuclear arms. It strains credibility that the Soviet Union would embark on such an adventure. What would the Soviet Union gain by undertaking a guerrilla war? Besides, developments within the Soviet Union indicate an unprecedented trend towards openness and liberalism within the country and for conciliation and co-operation with the outside world. At any rate, NATO's conventional forces have the means to knock out every single intruding Russian tank and frustrate the dreaded onslaught; and in manpower, finance, technology and conventional arms, Western Europe commands resources at least equal to those of the Soviet Union. This is a case of a false premise leading to a false doctrine.

Europe has a major role to play in strengthening world peace and, of course, it needs defence. However, for Europe to play its role, its defence must be independent. Only then will Europe be the important factor it ought to be for peace and harmony in the world. If the Europeans feel that a nuclear component is essential for their defence to be credible, they are in a position to provide one. I should vastly prefer a non-nuclear Europe, but the matter is for the Europeans to decide, and an independent European defence system, nuclear or non-nuclear, would be acceptable to me personally.

The ongoing negotiations for the removal of medium- and short-range non-European nuclear missiles and warheads from Europe—the zero option and the "double-zero" option—are in the news these days and much has been said about them here. I believe that these two propositions, which cover some 2,000 non-European nuclear warheads in all, are grossly insufficient. Although in the moribund arms reduction process one should welcome even a modest beginning, I wish to urge a bolder approach and adoption of the "triple zero" option: the removal from the area between the Atlantic and the USSR's European frontiers of not only all non-European medium- and short-range missiles, but also all tactical and battlefield nuclear weapons, whose numbers run into the thousands.

The latter weapons constitute, perhaps, the most pernicious threat to Europe's well-being. Their placement, command and control are widely dispersed and they are vulnerable to conventional attack. Since they appear small and harmless, in a moment of stress or irrationality someone might decide to unleash them—and we could have a nuclear desert in this rich cradle of human civilisation. Europe would be infinitely better off without them.

General Secretary Gorbachev has recently proposed a nuclear free world; he has suggested that the United States and the Soviet Union should aim at eliminating all nuclear weapons by the year 2000. That such a world is desirable is beyond dispute; whether such a world is within grasp, I am not sure. Nuclear technology is already quite widely spread, and in another 10 years, there will be in the order of three million pounds of spent fuel available, of which roughly one third could be separated as bomb-grade material. It is, therefore, not easy to say that in the event of a major conventional war nuclear weapons would not reappear on the scene, especially if a country with nuclear capability were faced with certain defeat. Perhaps this points to the need to ultimately abjure war in international relations. But, for the purposes of this discussion, the immediate needs are the step-by-step reduction of nuclear arms and comprehensive and objective international verification machinery to monitor reductions.

There are no panaceas for the nuclear mess in which we find ourselves. *Ad hoc,* impulsive actions will not do, and even our approaches to nuclear-arms control are *ad hoc.* That may in some measure be responsible for the continuing multiplication of nuclear weapons. It appears to me that the world desperately needs a long-term, global plan, for the next 15 to 20 years, with clearly defined stages and objectives for the nuclear age. A plan would help focus negotiations on real issues and reconcile the negotiating positions of the two sides. We can offer no detailed plan, but the following seven points should, form part of one, and we should like to place them before this group of experts for consideration:

1. All American and Soviet medium- and short-range nuclear missiles as well as all tactical and battlefield nuclear devices should be removed from Europe by agreed stages over the next five years;
2. The Soviet Union should immediately reduce, to a point satisfactory to the United States, its practice of encrypting its missiles and both countries should strictly adhere to the ABM Treaty and SALT II until the year 2005;
3. Both sides should reduce their strategic nuclear forces by 90 per cent in three or four agreed stages over a period of 10

years. This would be linked to a ban on research, development and deployment of space-based defences. At the end of 10 years, 4,000 to 5,000 warheads would remain, shared more or less equally between the United States and the USSR.

4. The United States and the Soviet Union should stop testing their ballistic missiles, since such tests are normally conducted to ascertain the accuracy and reliability of the missiles and thus to verify their first-strike capabilities;
5. After the above measures have been initiated, negotiations should begin on the limits to be placed on modernising and replacing British, French and Chinese nuclear forces. Possible reductions in these forces should be negotiated after points 1 and 3 have been substantially implemented.
6. All nuclear weapon powers must immediately agree to a comprehensive test ban. This is a vital first step, one necessary to forestall the production of destabilising weapons now under development, e.g., third-generation warheads with enhanced radiation effects, nuclear pumped X-rays, lasers and depressed trajectory missiles. Without a test ban, any cuts in existing nuclear forces would prove meaningless.
7. Objective and credible international verification machinery to continuously monitor reductions and test bans should be created. The United Nations General Assembly should take up the offer made by Argentina, Greece, India, Mexico, Sweden and Tanzania in their Mexico Declaration of 7 August 1986 in this regard, and ask them to set up international verification machinery at their expense but under the United Nations auspices.

Who will prepare the plan and how should we go about it? In the past, the United Nations special sessions on disarmament were content to deal with generalities, and at any rate a special session would entail too large a body to agree on the specifics of a well-ordered plan. The same would apply to the Disarmament Commission. The Conference on Disarmament in Geneva is a negotiating body and for various other reasons as well is not suited to the task, which must be performed by experts who are not tied to the official positions of their respective countries. A group of such experts exists in the form of the United Nations Advisory Board on Disarmament Studies. The Secretary-General could ask the Board to undertake the preparation of a draft plan to be submitted to the General Assembly for consideration.

The control and regulation of armaments is only one aspect of international security, which is, to a large extent, hostage to the ups and downs of the relationship between the United States and the Soviet Union. Their political and military rivalry and hostile encounters have resulted in the arraying of countries into hostile military blocs in some parts of the world and in the all-too-frequent eruption, elsewhere, of conflicts sponsored or supported by them in a variety of ways. Therefore, the first requirement for strengthening international security is to bring about a relaxation of tension between them. There are four great regions in the world: the Americas, Africa, Oceania or the greater Pacific region, and Eurasia, the sprawling but integrated landmass of Europe and Asia together. It would be comparatively easy to insulate the Americas, the Pacific region and even Africa against intrusions by a rival great Power. But, the conflicting interests and involvements of the Soviet Union and the United States impinge on each other at too many points in the Eurasian landmass, e.g., Western Europe, Israel and the Arab world, and it is here that their disengagement is most needed.

The Soviet Union straddles both Asia and Europe and in many ways serves as a bridge between the continents. The Soviet Union's borders, stretching from Finland in the north-western extremity of Europe to Japan and Alaska in the east, make her a close neighbour of many countries and of virtually each main region and subregion of the Eurasian landmass.

The United States, on the other hand, though a Power external to the region, has close historical and cultural links with Europe and Israel and is deeply interested in their survival, strength and prosperity. Western Europe is a potential Super-Power in military as well as economic terms and can look after itself. Israel's well-being can be assured provided it gives up its conquests and genuinely seeks the friendship of Arab States.

The United States' other interests in the vast landmass, perceived or real, are peripheral. The interests it seeks so aggressively to protect in Eurasia's problem areas, such as the Gulf or South Asia or the Indian Ocean, are in no sense vital to its peace and well-being. At best they are transient in character, as demonstrated by the United States withdrawal from Viet Nam. What induces American involvement in most Eurasian situations is not its interest but its political (rather than ideological) rivalry with the Soviet Union. Of course, it is a fact of international life that this rivalry exists, and the United States does not wish to see what it calls the "free world" fall under Soviet domination.

But, the United States is much too far away from most parts of the Eurasian landmass to effectively influence situations there, and Eurasian security has, therefore, to come from within Eurasia.

Eurasia is a landmass of many countries, races and religions, of vastly different systems of government, conflicting ideologies and interests, border disputes, ethnic conflicts and dramatic contrasts of poverty and wealth. Placed at the world's hub, it is a tinder-box of problems, many of which are not easily soluble. Constituents of this landmass must, therefore, co-operate together to create a Eurasian *modus vivendi,* a Eurasian compact if you like, based on an inner strength and tranquillity of the spirit which transcend surrounding pulls and pressures. The process must be initiated from within the region, and its larger and more powerful entities, such as the Soviet Union and China, the European Community, Japan and India, should begin consultations on this theme.

The intellectual basis for such an approach exists as *Panchsheel,* the five principles of peaceful coexistence that were defined jointly by India and China in 1954. Their essence is tolerance, with co-operation added if possible, or, in other words, simply living side by side in a non-violent way, despite differences and disagreement. These principles must be broadened and their acceptance and faithful observance promoted by all countries of the Eurasian landmass.

The role I see in this process for the United States is not one of arms, military or financial support or technical assistance. Nor is it a role of indifference or total detachment. It is the role of a benign, peaceable and beneficent Power which wants to see existing problems resolved, but knows that it can contribute comparatively little to their resolution and must, therefore, leave the task to those primarily concerned.

The role of the Soviet Union will naturally be more direct and crucial and it will also be more exacting. That great country's intentions are not in doubt, but the Soviet Union is the largest Power in the landmass and it devolves upon it to cultivate and create trust and to spread it around to all of its co-partners in Eurasia—Europe, the Middle East, China, Japan and elsewhere.

PRINCIPLES AND INITIATIVES IN THE UNITED STATES ARMS CONTROL POLICY

Under President Reagan's leadership, the United States has launched a number of far-reaching arms control initiatives. These include proposals for unprecedented, deep reductions in strategic offensive nuclear arms and intermediate-range nuclear forces, as well as a complete ban on chemical weapons. I will provide details of these initiatives in the course of my remarks.

First, though, we think it is important to make clear that the United States does not regard arms control as an end in itself. Arms control should be viewed as a means that nations can use to enhance their security interests and to support their national interests. Indeed, to be truly effective and enduring, arms control agreements must be accompanied by respect for and compliance with all the principles and provisions of the United Nations Charter.

President Reagan's Broad Agenda for United States-Soviet Union Relations

As true peace is not the mere absence of war, President Reagan has observed, so too it is not founded merely on the absence or limitation of weapons. Arms control, for example, is but one of the four "pillars" on which the United States is seeking to build better relations with the Soviet Union. The other three fundamental objectives are: resolving regional conflicts, progress on bilateral issues such as "people-to-people" exchanges, and advancing human rights.

The Soviet Union's involvement in regional conflicts is a critical indicator of whether its global aims are conducive to international peace. In Angola and Nicaragua, the Soviet Union through its Cuban proxies is pouring heavy amounts of military assistance into efforts by the communist regimes to crush popular resistance and consolidate their power. In Democratic Kampuchea, the Soviet Union is likewise heavily subsidising Viet Nam's military occupation. But, the most disturbing example is Afghanistan, where the Soviet army itself is waging a furious war against civilians and armed freedom fighters. Soviet involvement in these regional conflicts has a profoundly chilling effect on United States attitudes toward Soviet pronouncements of peaceful intentions.

The status of human rights and fundamental freedoms in the USSR has a profound effect on the East-West relations. Soviet abuse of fundamental rights is a deep source of mistrust and suspicion. Accordingly, we are watching with great interest the recently begun phenomenon of *glasnost* or openness. Following the recent release of some political prisoners and the relaxation of some censorship of cultural expression, we can only hope that a much greater easing of repression will take place. In our judgement, though, this will require much more than cosmetic changes. Deeds rather than mere words are needed. And unless change is pursued in a deep and consistent way, those who consider the new *glasnost* as primarily a public relations campaign will have the weight of evidence with them.

We can affirm that if truly profound reforms and openings in the Soviet system were to come about, our confidence in Soviet compliance with arms control agreements would become greater. The Soviet Union can verify United States compliance with agreements very simply because of the openness of our Government, our economy and virtually every other element of our society. The Soviet system offers us no such inherent means to verify compliance or detect strategic deception.

Therefore, we call on the USSR to apply real *glasnost* to its military policies and budgets. Let the people of the Soviet Union and the world see as much about Soviet military affairs as they see about United States military matters.

Basic Principles of United States Arms Control Policy

United States arms control objectives are integrated with our defence and foreign policies to enhance deterrence and stability, to reduce the risk of all war, especially nuclear war, and to support the security of our allies. Since the beginning of his Administration, President Reagan has followed these fundamental principles:

- We seek only those agreements which contribute to our security and that of our allies;
- We seek agreements which reduce forces, not simply limit them;
- To this end, we seek agreements on broad, deep and equitable reductions in offensive arms;
- Within the category of offensive nuclear arms, we give priority to reducing the most destabilising weapons, that is, fast-flying, non-recallable ballistic missiles;
- We also seek equitable arms control agreements in the areas of nuclear testing, chemical weapons and conventional forces;
- We insist on agreements that can be effectively verified. Arms control agreements without effective verification provisions are worse than no agreements at all.

These principles form the basis for our efforts to bring renewed integrity to arms control. A number of past agreements, it must be recognised, were flawed in concept. These and other agreements have suffered from Soviet violations.

Problems with Past Agreements

Typical of such flawed agreements was the SALT II Treaty of 1979. Rather than force real reductions, SALT II in fact sanctioned considerable increases in the number of nuclear weapons deployed on ballistic missiles and bombers. The most basic flaw of the SALT approach was that it focused on limits on launchers and placed only indirect and inadequate limits on ballistic missile warheads and throw-weight—the real measures of ballistic missile capability. Thus, the SALT II accord did nothing to reduce, and little even to limit, the nuclear threat. If ratified, it would have undermined the stability of the United States-Soviet strategic relationship.

Imperfect as many earlier arms control agreements were, their faults were compounded by the Soviet Union's failure to abide by key provisions. In violation of SALT II, the Soviet Union encrypted telemetry associated with ballistic missile testing in a manner which impeded verification. It deployed a prohibited second new type of ICBM, the SS-25, and exceeded the numerical limit on strategic nuclear delivery vehicles.

The Soviet Union also violated the 1972 SALT I Interim Agreement's prohibition on the use of former ICBM facilities. Specifically, the Soviet Union used former SS-7 ICBM facilities to support deployment of the SS-25 mobile ICBM.

Moreover, with its facility at Krasnoyarsk, the Soviet Union is violating the anti-ballistic missile (ABM) Treaty. This large, phasedarray radar violates the ABM Treaty in its associated siting, orientation and capability. Because of our concerns about both the Soviet Union's poor record of compliance and flaws in past agreements, since May 1986 the United States has based decisions regarding its strategic force structure on the nature and magnitude of the threat posed by Soviet strategic forces. President Reagan has also determined that the United States will not deploy more strategic nuclear delivery vehicles nor more strategic ballistic missile warheads than the Soviet Union. Thus, while ensuring an adequate strategic deterrent, the United States continues to exercise the utmost restraint.

United States Arms Control Initiatives

Let me turn now to the current status of negotiations between the United States and the Soviet Union on arms control. The United States has put forward far-reaching proposals that could substantially mitigate the threats now posed by strategic offensive nuclear arms, intermediate-range nuclear forces (INF) and chemical weapons.

We are now working to conclude an agreement for deep reductions in INF. On 23 April, negotiators resumed work in Geneva that could, if the Soviet Union is serious, result in a verifiable treaty on INF. We have indicated we would sign a treaty, as an interim step, that embodies the Reykjavik formula of reducing United States and Soviet longer-range INF (LRINF) missile warheads to a global limit of 100 warheads, with none in Europe. Those remaining would be deployed in the United States and Soviet Asia.

Our ultimate goal, however, remains the complete elimination of all LRINF missile systems on a global basis. Since weapons of this type are easily moved, their complete elimination would reduce the threat to our allies and aid in achieving effective verification.

We welcome the opportunity to discuss the total elimination of United States and Soviet shorter-range INF (SRINF) systems, as suggested by General Secretary Gorbachev in Moscow. We hope the Soviet delegation will table a proposal for discussion soon. As with LRINF, the United States principles for dealing with SRINF are global applicability and equality. These principles are essential elements of our policy and the United States will not deviate from them.

While we welcome any stabilising reductions of intermediate-range missiles that enhance security, it is necessary that we make progress in other areas as well, including strategic nuclear weapons, chemical weapons and conventional forces. In 1985, at the Geneva summit, General Secretary Gorbachev agreed to accelerate progress in areas of common ground, including 50 per cent reductions in strategic offensive nuclear weapons. Further progress towards this goal was made last October at Reykjavik.

In April, in Prague, General Secretary Gorbachev said the reduction of strategic arms was of paramount importance and called it “the root problem” of arms control. Yet, when he met a few days later with Secretary Shultz, he refused to drop his insistence that any reduction in offensive arms be linked to restrictions on the testing and development of strategic defences. These constraints are not acceptable because they would cripple the United States Strategic Defense Initiative (SDI), our hope for a more stable deterrent based increasingly on defensive systems. One point I would like to make especially emphatic and clear to this audience of international experts is that the defensive systems President Reagan envisions through SDI threaten no one.

We challenge the Soviet leaders, therefore, to get at the root problem, the high levels of devastating weapons targetted against one another. For our part, the United States delegation in Geneva on 8 May tabled a draft treaty on strategic arms reductions to cut strategic systems by 50 per cent according to the Reykjavik formula. This draft Treaty, in addition to the overall reductions, provides for specific restrictions on the most destabilising and dangerous nuclear systems. Moreover, our draft Treaty responds to Soviet concerns over the speed of reductions by extending the period for them from five to seven years. Agreement on strategic arms reductions is possible, even as soon as this year, if the Soviet Union is ready to move forward.

Besides action concerning INF systems and the root problem of strategic offensive nuclear weapons, positive movement is also needed towards redressing the conventional force imbalance and putting into effect a verifiable ban on chemical weapons. At the Conference on Disarmament in Geneva in April 1984, the United States tabled a comprehensive treaty banning the development, production, use, transfer, and stockpiling of chemical weapons. This ban would be verified by various means, including prompt, mandatory on-site inspection by challenge. At the November 1985 Geneva summit, President Reagan and General Secretary Gorbachev agreed to intensify bilateral discussions on all aspects of such a chemical weapons ban. Five rounds of bilateral talks on this subject have been held since then, with a sixth scheduled to begin this summer.

Regarding conventional forces, too, the United States and our allies are continuing to press for stabilising arms control. In the Vienna Talks on Mutual Reduction of Forces and Armaments and Associated Measures in Central Europe, the North Atlantic Treaty Organisation (NATO) has sought assiduously to meet Soviet concerns, while the Soviet Union has not yet responded constructively to Western initiatives. The 23 member States of NATO and the Warsaw Treaty are currently engaged in discussions to establish a new forum for addressing conventional force stability in Europe.

One encouraging development in the field of confidence-building was the recent United States-Soviet agreement on a draft joint text to establish nuclear risk reduction centres in our respective capitals. This agreement, which was a direct result of a United States initiative, is a practical measure that will strengthen international security by reducing the risk of conflict between the United States and the Soviet Union that might result from accident, misinterpretation or miscalculation.Yet another positive development was the adoption by the Stockholm Conference on Confidence- and Security-building Measures and Disarmament in Europe in September 1986 of a set of confidence-building measures, based largely on NATO proposals, designed to increas openness and predictability in military activities in Europe. Much more action needs to be taken concerning conventional forces. As we move to reduce nuclear weapons, we do not want to make the world "safe" for aggression or intimidation based on Soviet superiority in conventional forces.

If stability and peace truly are to be advanced, progress must be made on building all four pillars of United States-Soviet relations. In the area of arms control, Soviet forthcomingness is necessary in every major category. Only when the Soviet Union begins to work in earnest on the broad agenda of international peace can it be said that it is taking the necessary steps towards creating a safer world.

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OFFICIAL DOCTRINAL POSITIONS OF THE NUCLEAR WEAPON STATES

A. China

Basic Positions of the Government of China on Nuclear Weapons and Nuclear Disarmament

1. China has consistently opposed the arms race and *is* dedicated to the cause of maintaining world peace and security. China always stands for disarmament and complete prohibition and thorough destruction of nuclear weapons.

2. China declared on the very first day when it came into possession of nuclear weapons that at no time and under no circumstances would it be the first to use nuclear weapons. China respects the status of the existing nuclear -weapon free zones and will not use, or threaten to use, nuclear weapons against non-nuclear weapon States or nuclear weapon free zones.

3. With respect to nuclear disarmament, China is of the view that:

(a) The ultimate goal of nuclear disarmament should be the complete prohibition and thorough destruction of nuclear weapons. All measures aimed at nuclear disarmament should serve the realisation of this goal;

(b) The United States of America and the Union of Soviet Socialist Republics possess the world's largest and most sophisticated nuclear arsenals and are still improving and upgrading their nuclear weapons. They bear a special responsibility for halting the nuclear arms race and reducing nuclear weapons. They should take the lead in halting the testing, production and deployment of all types of nuclear weapons, reducing and destroying drastically all types of nuclear weapons that they have deployed anywhere inside or outside their countries. After this is done, a broadly representative international conference on nuclear disarmament may be convened with the participation of all nuclear -weapon States to discuss further steps and measures for thorough destruction of nuclear weapons. This would be a truly effective way to achieve nuclear disarmament;

(c) As an effective measure to prevent nuclear war, all nuclear weapon States should undertake not to be the first to use nuclear weapons at any time and under any circumstances, and not to use or threaten to use nuclear weapons against non-nuclear - weapon States and nuclear weapon free zones. On this basis, an international convention banning the use of nuclear weapons should be concluded with the participation of all the nuclear weapon States.

B. France

Defence Doctrine of France

1. France's defence doctrine rests on nuclear deterrence. As the President of the Republic said in his speech to the Institute of Advanced National Defence Studies on 11 October 1988:

> "Deterrence means preventing any possible aggressor from meddling with our vital interests because of the risks he would run. Deterrence does not exist to win war but to prevent, to forestall it."

2. The point is that the weak can deter the strong by means of a range of resources capable of persuading the opponent that the nuclear risk he runs on his own territory would outweigh any benefit he might think to gain by attacking France.

3. A nuclear weapon is thus a political weapon, a diplomatic weapon for keeping balance and countering blackmail from any source. It renders the very enterprise of war pointless, since war becomes impossible to win.

4. This is why France's deterrent force does not seek to match the opponent's nuclear capacity but is based on the idea of sufficiency, made possible by the equalising power of the atom.

5. This is also why it must be maintained above the credibility threshold by means of continuous, technologically wholly independent modernisation.

6. Given the seriousness of the stakes, France considers that only a threat to its vital interests—that is, the very existence of the nation —

could justify the use of its *force de frappe* (strike force). For that very reason, the decision to use force rests with the Head of State alone, whose autonomy must be absolute: he is the one who has to define where France's vital interests begin.

7. French deterrence has another component, the final warning, which is an integral part of it. The final warning, delivered against a military target—by pre-strategic weapons in the first instance, even if the final warning is not solely a matter for short-range weapons — is to indicate to the aggressor that the vital interests of France are at stake and that continued aggression will result in strategic weapons being used.

8. By offering a chance of last-minute negotiations, the final warning theory enhances overall deterrence.

9. France's autonomy of decision allows the criteria for and timing of the use of nuclear force in the event of aggression to remain uncertain, thus increasing the deterrence effect.

10. While nuclear weapons, on which deterrence rests, have been chiefly responsible for keeping the peace for more than 40 years, and while France believes that the human mind cannot come up with any credible alternative to nuclear weaponry for exercising deterrence, this of course does not make France any less well-disposed towards efforts to reduce nuclear over armament. It thus attaches the highest priority to Soviet-American strategic talks and devoutly hopes for an agreement resulting in a substantial reduction in the arsenals concerned. It hopes that those efforts will continue.

11. The French President, speaking on 28 September 1983 at the United Nations, clearly stated the three prior conditions France has set before it will take part in any negotiations:

> "The first of these conditions is the correction of the fundamental difference, in terns of type and quantity, between the armaments of the two major powers and those of the others...
>
> "The second condition flows from the wide gap between conventional forces, particularly in Europe, a gap which has become even wider... because of the existence of chemical and biological weapons, the manufacture and stockpiling of which must be prohibited by a convention.
>
> "The third condition is the cessation of the escalation in anti-missile, anti-submarine and anti-satellite weapons."

12. France devoutly hopes that these conditions will be fulfilled and will spare no effort to attain this end.

C. Union of Socialist Republics Russia

Military doctrine of the USSR

1. Soviet military doctrine is profoundly defensive, aimed at guaranteeing the security of the USSR and its allies. Its goal is not to prepare for, but to prevent, nuclear war.

2. That goal was reflected, in particular, in the Soviet Union's pledge never in any circumstances to be the first to use nuclear weapons. That most important political act reflects the determination of the Soviet Union to work for the gradual reduction and, ultimately, complete elimination of the risk of a nuclear war. The Soviet Union believes that a nuclear war must never be fought and cannot be won.

3. The Soviet Union is a staunch opponent of war in all its aspects. It considers that a nuclear war, once begun, would assume global proportions and would have disastrous consequences not only for the belligerents cut for all mankind; the assumption that such a war can be restricted to one region of theatre of operations is untenable.

4. Historically, the Soviet Union was compelled to develop nuclear weapons and subsequently assemble nuclear forces as a countermeasure.

5. However, the USSR considers that state of affairs to be an intermediate stage in the radical reduction of nuclear weapons—which has already begun—since the current balance of the nuclear potentials of the opposing sides is disproportionately high and, for the time being, only guarantees equal peril for both sides. The continuation of the nuclear-arms race will inevitably increase that equal peril and may lead to a situation in which even parity will cease to be a factor in military and political restraint.

6. Hence, the Soviet Union is in favour of guaranteeing strategic stability at the lowest possible level of nuclear balance and, in the long run, eliminating nuclear weapons completely. This goal, of course, cannot be achieved immediately. It has to be approached through a process of step-by-step reductions by all nuclaar-weapon States, with guarantees, at every stage, of international security and strategic stability.

7. The Soviet Union has put forward a balanced programme for the elimination of nuclear weapons by the year 2000, which was presented in the statement by the General Secretary of the Central Committee of the Communist Party of the Soviet Union, M. S. Gorbachev, on 15 January 1986.

D. United Kingdom of Great Britain and Northern Ireland

United Kingdom Nuclear Doctrine: Deterrence After the INF Treaty

1. The central aim of the NATO Alliance's defence effort is clear and simple: to remove the option of war permanently from the East/West scene. Nuclear weapons have made this aim wholly compelling and for that very reason wholly attainable. Their virtually infinite destructive power has made nonsense of the idea of war as a contest of strength. That result is irreversible, since it rests on scientific knowledge that cannot be forgotten. The right course is not to attempt vainly to dissolve it, but to build around it a war-prevention system that, without surrendering the great stability we have now, will become progressively less costly and less abrasive.

2. The goal must be a system giving each side thorough assurance—grounded, amid the strains of a changing world, not on beliefs about attitude or motive but on objective military fact—that the other neither has nor seeks options for resolving differences by force. If the East shares that goal, it can increasingly be attained through open and well-understood policies cancelling war not through the brandishing of armaments but through their quiet maintenance at the lowest level needed to ensure that the utter irrationality of aggression remains a plain certainty.

3. Much that President Gorbachev has said encourages us to hope that he may see the central security need increasingly as we do. There seems ground for optimism that, both in the extensive arms control agenda and elsewhere, he will be ready to work with us towards a less tense and costly security system. The Soviet Union still has much larger forces in most categories, and its strategic situation is not the same as the West's; its priorities therefore are different. But, with agreement on the central goal, patient and clear-sighted work can bring both parties steadily closer to it in safety.

4. The 1987 INF Treaty, achieved as growing Soviet realism converged with NATO steadfastness, was a major advance in easing tension and building confidence. Its content was specific and exact: the strictly verified abolition of a defined class of missiles. Nothing in it implies an agreement to abandon operational roles or strategies, or leave a hole in the middle of NATO's ability to respond flexibly.

5. Flexible response is the only strategic concept that makes sense for a defensive alliance in the nuclear age. Military victory in the classical sense is not feasible; the use of force at any level, but especially the

nuclear level, can have no other aim than to deny an aggressor swift success and to show him that he has underrated the defender's resolve and must, for his own survival, back off. The circumstances in which this task would arise could vary greatly; the defence must therefore have a wide range of options, enabling it to react to any military situation promptly and with the least force needed for the basic political aim of ending the war. Nothing in the INF Treaty makes this strategy less apt than before, or reduces the need to ensure, through the manifest ability to implement it in credible ways, that aggression can never be attractive.

6. For flexible response NATO has to maintain an effective nuclear armoury at several levels. Strategic weapons alone, for all their awesome power, could not be morally tolerable, practically feasible or politically credible for every scenario. Our needs at non-strategic levels will continue to evolve in line with our arms-control commitments, with new technology and with deeper understanding on both sides of the minimum imperatives of mutually assured security. NATO has made major cuts in its non-strategic armoury; the number of warheads in Europe is now 35 per cent less than in 1979, and will fall further by mid-1991. The INF Treaty's abolition of intermediate-range missiles follows past NATO decisions to abandon successively nuclear infantry weapons, nuclear anti-aircraft missiles and nuclear land-mines.

7. Cuts in the armoury can go further yet, and the alliance is working on the possibilities. But, the aim for which the armoury as a whole exists, of surely preventing war, cannot be served if we attempt to follow simultaneously both the path of cuts and the path of obsolescence. Nuclear weapons are not mere symbols; like other weapons, they can deter only by evident capability for effective use. Modern technology offers major improvements in range, accuracy and target-acquisition, and these can enable us to cut weapon numbers. But, there is no prudent basis for making the cuts without the improvements.

8. NATO is studying how to keep up-to-date its armoury of warheads supported by the provision of delivery systems and basing arrangements in which European nations rightly share the burden. NATO's military authorities have reported on this to the Nuclear Planning Group. Ministers will consider the steps that need to be taken, for example, replacing the Lance missile, to keep the armoury as a whole at the standard of effectiveness and versatility, and no larger than the minimum size, needed to sustain its purpose.

9. The United Kingdom will continue to play a full part in this effort, and also to maintain the independent non-strategic contribution

without which the value of our strategic force, which provides a separate second centre of nuclear decision-making in support of Alliance strategy, would be seriously incomplete. Our non-strategic contribution has since the 1960s rested on WE177 free-fall weapons, usable from various aircraft and in various roles. For technical and operational reasons, these cannot all be relied upon beyond the 1990s. As with the rest of the Western armoury, numbers and types may not have to be kept at present levels; that needs further study. But, under the strategy of flexible response, the basic need for some non-strategic weapons will remain, and procurement lead-times means that initial decisions on modernisation—particularly on the choice of an air-launched missile to which warhead work at Aldermaston will be geared—must be taken before long.

10. Work like this has its full counterpart on the Soviet side. Nothing that President Gorbachev has said or done is ground for imagining that he will run military risks with his country's security on suppositions about Western goodwill. We must be similarly objective, recognising that if there is indeed a Soviet reassessment enabling us all to work together more constructively, it would be folly to dismantle, or let decay, the very structures that have helped to induce it. Cool and steady realism of this kind is not an obstacle but the best guide to strengthening the security system we seek—one in which the total neutralisation of war, by agreed non-confrontational means, becomes so sure, accepted and permanent that, even when interests may differ widely, nations of East and West can conduct their business together by means in which the thought of armed conflict simply plays no part.

E. United States of America

United States Deterrence Policy

1. Deterrence works by making clear that the costs of aggression will exceed any possible gain. This is the basis of United States military strategy against both conventional and nuclear aggression; because conflict carries the risk of escalation, the United States goal is to dissuade aggression of any kind and to prevent coercion of the United States, its allies and friends.

2. To ensure deterrence, the United States must make clear that it has both the capability and the will to respond effectively to coercion or aggression. While emphasising its resolve to respond, the United States must avoid specifying just what form the response will take. This is the essence of "flexible response," which has been United States policy since 1961 and a key element of NATO strategy since 1967. A

potential aggressor faces three types of possible response by the United States:

(a) Direct defence: to pose the possibility that aggression will be stopped without actions that escalate the conflict. This is sometimes referred to as "deterrence through denial". Defending against conventional attack with conventional forces is an example of direct defence;

(b) Threat of escalation: to warn that aggression could start hostilities that might not be confined to conventional response only, and that escalation could lead to costs that far outweigh any possible gain and that are greater than an aggressor anticipates or could bear. In this regard, NATO's deterrence of aggression is enhanced by NATO resolve to use nuclear weapons, if necessary, to halt that aggression;

(c) Threat of retaliation: to raise the prospect that an attack will trigger a retaliatory attack on the aggressor's homeland, causing him losses that far outweigh any possible gain.

3. While deterrence requires capabilities across the entire spectrum of nuclear conflict, its essential foundation is provided by United States strategic nuclear forces and the doctrine that supports them. The United States must ensure that the effectiveness of these forces and the will to use them, if necessary, are never in doubt.

4. The United States maintains diversified strategic retaliatory forces to prevent a disarming first strike. It maintains a variety of basing modes, launch platforms and attack vehicles, with a triad of submarine-launched ballistic missiles, ground-based intercontinental ballistic missiles and strategic bombers. Adequate and survivable command, control and communications are also essential to United States force structure and to the credibility of the deterrent.

5. United States forces and targeting policy must be perceived as making nuclear warfare unacceptable. The United States does not target populations as an objective in itself and seeks to minimise collateral damage through more accurate, lower-yield weapons.

6. Holding at risk the full range of a potential aggressor's assets is necessary for deterrence, but is not sufficient. United States options in response to aggression cannot be limited to capitulation or mutual destruction. The United States must have the capability and the resolve to employ a broad range of military options.

7. Finally, the United States requires residual capability, as leverage for early war termination and to avoid post-conflict coercion. For this reason, a nuclear reserve force is an integral part of United States strategic forces. In addition, the United States maintains continuity of Government programmes to ensure its capability to retaliate in case of an attack aimed at incapacitating its political and military leadership.

8. These capabilities do not imply that the United States seeks the ability to fight a nuclear war. The United States has repeatedly emphasised that nuclear war cannot be won and must never be fought. But, any adversaries must understand that they cannot gain their objectives through nuclear warfare or nuclear coercion under any circumstances.

9. Continuing modernisation of United States forces is essential. While the United States is committed to arms reductions as one component of policy for enhancing United States and allied security, this does not remove the need for modern nuclear forces for deterrence. Neglecting modernisation in expectation of arms reduction agreements would decrease the likelihood of such agreements by reducing incentives to negotiate.

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THE FISSILE MATERIAL CUT-OFF TREATY

Recent years have witnessed significant progress in promoting non-proliferation and disarmament measures. Within the framework of the Chemical Weapons Convention (CWC) and the Biological and Toxin Weapons Convention (BWC), two out of three categories of weapons of mass destruction have been comprehensively prohibited. The indefinite extension of the Nuclear Non-Proliferation Treaty (NPT) and the recent progress in creating nuclear weapon free zones have eliminated the threat of nuclear weapons from an ever growing number of regions of the world and strengthened non-proliferation goals. Such progress, brought about due to the emergence of a positive international climate, has engendered a renewed focus on existing nuclear arsenals that continue to pose a global threat in terms of their numbers, reach and readiness.

The end of the cold war confrontation and reductions in nuclear weapons in the form of the Intermediate- and Shorter-Range Nuclear Forces (INF) and Strategic Arms Reduction (START I and II) Treaties have reduced the nuclear threat significantly and created the conditions in which long-overdue measures in the field of disarmament can be pursued more vigorously and with fruitful results. It was the existence of such conditions that made it possible last year to conclude the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

There exists today an unprecedented and compelling body of international opinion converging on the need for specific measures for nuclear disarmament leading to the total elimination of nuclear weapons. The non-aligned countries have called for negotiations at the Conference on Disarmament (CD). A group of 28 countries proposed a "Programme of Action" enumerating the elements that could form part of a comprehensive disarmament programme. The Canberra Commission has also highlighted the specific steps that can be taken immediately, to be followed by other measures over time. Several eminent individuals and groups, including people who have been involved in decision-making affecting nuclear arms and strategic policy, have also stressed that the total elimination of nuclear weapons is an immediate and indispensable priority and a feasible and necessary condition for promoting security in the post-Cold War Era.

Certain common elements and cogent reasons underpin growing international support for specific steps for nuclear disarmament:

- Continued reliance on nuclear weapons is incompatible with the universal commitment to their elimination. It also prevents fulfilment of the obligations for nuclear disarmament under article VI of the NPT.
- Recent progress in arms control, non-proliferation and disarmament has opened a window of opportunity to consolidate the gains made. If, however, international relations were to deteriorate, the nuclear arms race could resume, bringing with it an uncertain future.
- Retaining the policy of nuclear deterrence obstructs development of friendly relations and the existence of nuclear forces perpetuates suspicion and mistrust.
- Serious pursuit of disarmament will strengthen the non-proliferation regime. Despite the discriminatory character of the NPT, its role in preserving stability by limiting horizontal proliferation is well-recognised. The possession of nuclear weapons by a few States, however, creates ambivalence among other States about the normative value of non-proliferation efforts.
- The advisory opinion of the International Court of Justice (1CJ), that there exists a legal obligation to pursue and bring to a conclusion negotiations leading to a world free of nuclear weapons, has established an important legal standard. The Court's ruling sets the goal of negotiations as something to be undertaken in the present with the objective of concluding them, in my view, in a given frame work of time.
- Nuclear disarmament should be a global endeavour involving multilateral efforts. It has been argued that this will create impediments rather than facilitate the realisation of the objective of nuclear disarmament, that it could lead to a long, drawn-out multilateral process of negotiations that would favour the

retention of nuclear weapons for much longer periods and could divert attention, even disrupt, the bilateral process of nuclear reductions. Such fears do not seem well founded since all parties are committed to conducting "good faith" negotiations towards nuclear disarmament.

- There is also an erroneous assumption that what is being called for is the multilateral negotiation of the gamut of verified reductions. The Programme of Action proposed by the 28 members of the CD, for example, is designed to identify measures that may constitute part of the programme, their priorities, and the phases and time-frames within which they could be achieved. Each disarmament measure included in the programme would be negotiated through the most appropriate mechanism for that specific measure—bilateral, regional, multilateral or global. The specifics of the measure would also determine the countries whose participation would be relevant to its negotiation.
- There can be no underestimation of the magnitude of complexity of the tasks involved. This, however, should not become a reason for inaction. Because the specific undertakings in the programme of disarmament will be daunting and complicated, the first steps should be taken now.
- A commitment to and concrete progress towards the complete elimination of nuclear weapons can be undertaken immediately. A number of specific steps for a reduction of the threat of nuclear weapons and for nuclear disarmament have been advanced recently in both official and non-official documents. A common proposal, which has attracted wide interest in terms of its feasibility in the immediate future, concerns the declaration of an unambiguous commitment to the elimination of nuclear weapons. In a specific proposal put forward in a statement at the CD on 30 January 1997, Pakistan stressed that it was urgent to secure "a legally binding international agreement committing all States—nuclear and non-nuclear—to the objective of complete elimination of nuclear weapons. This is also a central recommendation of the Canberra Commission. We should adopt a simple, short treaty which would contain such a commitment and an undertaking to pursue 'good faith' negotiations to achieve the goal of eliminating nuclear weapons in the foreseeable future."

These new thrusts in the nuclear disarmament debate, which I just highlighted, have been described by some as a "change of paradigm". The pursuit of a nuclear weapon free world is not only considered necessary, but is now thought feasible by governments, intellectuals and thinkers alike. A multilateral negotiating process, organised to take into account the imperatives of the post-cold war world, could lead to progress on long-standing nuclear disarmament issues.

One such issue is the proposal for the prohibition of the production of fissile material for weapons purposes—the fissile material cut-off treaty (FMCT). In the past, the idea was debated as part of the larger process of the cessation and reversal of the nuclear arms race and nuclear disarmament. Then, it was believed, a halt in the production of fissile material and banning nuclear weapons production could have cut short the nuclear arms race. Such action would have left a much less daunting legacy of the cold war. The well-known proposal by Canada, for example, envisaged a prohibition on all production of fissionable material for weapons purposes as part of a "strategy of suffocation" to achieve a cessation of the nuclear arms race in pursuit of the goal of nuclear disarmament.

There were serious doubts about the structure and scope envisaged for such an agreement. Its purpose would have been to ban the production of highly enriched uranium (HEU) and the separation of plutonium not subject to international safeguards or for nuclear explosive purposes, though material produced prior to the effective date of the agreement would remain outside the prohibition. Three obligations were foreseen

- to desist from manufacturing HEU or separating plutonium for research or development of nuclear explosive devices;
- to refrain from assisting other States in this regard; and
- to accept IAEA safeguards for the purposes of verifying the implementation of these undertakings.

A series of Assembly resolutions were adopted on this issue until 1992. Objections were raised on various grounds, but primarily because a stronger commitment to the cessation of production of nuclear weapons was sought. The resolutions were, however, repeatedly adopted by large margins, including positive votes by Pakistan.

At the 48th session of the Assembly in 1993, President Clinton of the United States, in announcing a number of initiatives to promote nuclear non-proliferation, proposed to negotiate an international agreement that would ban production of plutonium and HEU for weapons forever. The Assembly thereupon adopted by consensus resolution 48/75 L, entitled "Prohibition of the production of fissile material for nuclear weapons or other nuclear explosive devices".

This resolution omitted, however, a provision that had always been contained in previous resolutions. It stated that "the cessation of production of fissionable material for weapons purposes and the progressive conversion and transfer of stocks to peaceful uses would also be a significant step towards halting and reversing the nuclear-arms race." The 1993 resolution merely stated that such a convention would be a "significant contribution" to "nuclear non-proliferation in all its aspects".

It is important to bear in mind that while the language of the resolution was kept restrictive in order to secure consensus, that consensus was possible largely because the initiative on which it was based addressed a broader framework encompassing such important issues as the "elimination where possible of accumulations of stockpiles of HEU or plutonium" and recognised the need to address associated regional problems by mentioning the need for "more restrictive regional arrangements".

Both issues, namely, the question of stockpiles and specific regional security concerns, are of fundamental importance and need to be addressed properly. The idea of an FMCT no longer centres on a "strategy of suffocation". Over the decades fissile material has been produced in such great quantities that, apart from important disarmament concerns, this material poses serious problems of safe storage and disposition. Furthermore, the issue is no longer confined to the actions of the five declared nuclear weapon States, but presents problems relating to security in regions such as South Asia and the Middle East.

The linkage of nuclear disarmament and security assurances with other agenda items in the CD, taken together with the view prevailing among a significant number of participants on the issue of stockpiles, does not augur well for the prospect of successful negotiations on a fissile ban. The Shannon-II formulation was meant to allow negotiators to address the question of stockpiles. Yet, as plutonium and HEU are used in nuclear weapons regardless of whether they were specifically produced for such, the issue of stockpiles will have to be addressed more comprehensively than what has been contemplated under even that mandate. Experts have identified four possibilities for a future convention:

- The basic concept of a fissile material cut-off, as envisaged by the 1993 resolution, is to place a ban on future production of plutonium and HEU for weapons purposes. This formulation has an extremely narrow application as it only affects nuclear weapon States (NWS) and the non-NPT States. As regards NWS, it is an accepted fact that they have already enough stockpiles and do not need to produce any more—so virtually it does not affect them in any manner except in the realm of verification. NPT member States are already bound by the Treaty; they do not need any additional treaty to meet the same obligations. Hence it actually affects non-NPT States, particularly the so-called "threshold States"—India, Israel and Pakistan. The proposed concept is being seen by some as a new derivative of the NPT, which would only be used to halt proliferation and would not contribute towards nuclear disarmament.
- A ban on production or stockpiling of plutonium and HEU for weapons purposes, as is being suggested by most of the non-aligned countries. This would also bring existing stockpiles under its mandate. It would serve as a check on the safe storage of existing stocks, their non-diversion and, more importantly, catalogue the fissile material being recovered from dismantled warheads and prevent their reuse in nuclear weapons by placing them under IAEA safeguards.
- A ban on production and stockpiling of fissile material and tritium for military purposes. This proposal has two additional implications:
  - (i) it includes tritium, which is considered essential for refining nuclear design, and
  - (ii) it extends the application to long-range nuclear-powered submarines.
- A ban on production and stockpiling of weapon-usable fissionable material. This comprehensive concept would prohibit plutonium processing and uranium enrichment altogether, on the grounds that the possession, trade and transport of essential material (even meant for civil use) carries too great a risk for proliferation and accidental hazards.

When the work on the FMCT starts, these issues will have to be clarified. Among these, the most important issue is the appropriate scope of the treaty. A related issue is the method by which asymmetry in the reduction and elimination of stockpiles should be addressed at the global and regional levels. Other issues concern the physical protection of stockpiles, illegal trafficking of fissile material, international storage and the final disposal of accumulated fissile material, particularly plutonium.

Conclusion

There is as yet no clear political consensus on the framework and the objectives of the proposed convention. The Shannon report, did not remove the basic divergence in the positions of States with regard to the scope and objectives of the treaty. For three consecutive years since 1993, the General Assembly has not adopted any resolution on the subject. It is well known that following the inability of the CD to reach consensus on the text of the CTBT, one of the original co-sponsors of the 1993 resolution on the FMCT has now sought assurances regarding the disarmament value of the FMCT.

Some nuclear weapon States have affirmed that the FMCT constitutes an essential disarmament measure. This declaration is to be welcomed. The nuclear weapon States could advance negotiations by making the disarmament aspects of the FMCT more apparent. The challenge facing the negotiators in Geneva is to agree and begin meaningful negotiations on important pending items that address the legitimate security concerns of all the participants.

The 1993 Assembly resolution did not specify a forum of negotiations to proceed with the FMCT. The CD was regarded as the most appropriate forum for doing so. The CD has before it several proposals, including the FMCT initiative on which work can commence. It is hoped that the CD will organise its work in such a manner that both the global nuclear threat and regional imperatives will be adequately addressed to respond to the growing expectations of the international community in the field of disarmament, non-proliferation and international security.

THE FISSILE MATERIAL CUT-OFF TREATY: IMPERATIVES AND PERSPECTIVES

The question, Why is the FMCT a good idea?, is not easy to answer because there are different conceptions of what such a treaty should do. On the one hand, there are those who believe the FMCT should focus on fissile material produced *after* the cut-off date; in short, they want it to deal only with “future production”. On the other hand, there are those who also want the FMCT to cover fissile material produced *prior* to the cut-off date; in short, they want it to deal with "stocks".

The issue of "stocks" has come up repeatedly in preliminary discussions of the FMCT in the Conference on Disarmament (CD). Whether "stocks" should be covered by the treaty or not is a fundamental point that cannot be dodged. Our understanding of the term "stocks" is that it refers to all fissile material produced *prior* to the cut-off date. In the case of nuclear weapon States, a part of those "stocks" will be required to maintain their nuclear forces and a part of them will not be required for that purpose.

Many States want to see the FMCT cover that portion of stocks that nuclear weapon States will require to maintain their nuclear forces, in order to get at the nuclear forces they sustain. That is an understandable aspiration. But, the reality is that no nuclear weapon State is going to accept that the size of its nuclear forces should be addressed by this back-door means. The size of the nuclear forces of the nuclear weapon States will have to be addressed by those same States in the framework of negotiations dealing directly with those forces—beginning with the further development of the bilateral START process. Any attempt to have the FMCT deal with that portion of their stocks that the nuclear weapon States require to sustain their nuclear forces is bound to fail.

What about the portion of their stocks that will not be required to maintain their nuclear forces? Most nuclear weapon States have such stocks. In some cases, these stocks have been created by the reprocessing of civil reactor fuel. In other cases, these stocks will include fissile material made surplus to defence requirements by large reductions in nuclear forces. In some cases, both factors may be at play. The position of individual nuclear weapon States varies.

In the United Kingdom, on current plans, the reduction in nuclear forces will produce fissile material surplus to defence requirements. There is a straightforward reason for this; the stocks associated with defence requirements are already at minimum levels. The United Kingdom has stocks of separated plutonium accumulated over many years as a result of reprocessing the vast majority of civil reactor fuel. But, this material is already under EUR ATOM safeguards and can be designated for inspection by the IAEA. So it is not clear that there would be any significant gain from having these stocks covered by the FMCT. The French and Chinese must speak for themselves. The French position is most likely similar to the United Kingdom's. China probably has neither surplus stocks from reductions in its nuclear forces nor stocks from the reprocessing of civil reactor fuel.

Russia may have some stocks of plutonium from reprocessed civil reactor fuel. Like the United Kingdom, it has seen a case for reprocessing such fuel. By contrast, as is well known, the United States has had a policy of not reprocessing its civil reactor fuel. Both these countries, however, can be expected to have an increasing amount of fissile material which they no longer need for defence purposes as a result of large reductions in their nuclear forces. Like many other States, the United Kingdom welcomes the moves made by the United States to place some of these stocks under IAEA safeguards, and we hope Russia will soon take similar steps. It seems very unlikely that either of these countries will permit others to tell them how much of their stocks they must regard as surplus to their defence requirements.

It follows from these considerations that it will be a fruitful exercise to address in an FCMT even that portion of their stocks that the nuclear weapon States do not require to maintain their nuclear forces. Either there are no such stocks, or they are already covered by safeguards, or moves can best be made to bring them under safeguards in other ways. As we have already demonstrated, it is simply not realistic to suppose that the FMCT can cover that portion of their stocks that nuclear weapon States do require to maintain their nuclear forces. Though complicated, the underlying message is a simple one—it is that trying to tackle any aspect of stocks through an FMCT is not likely to be at all productive.

There is also another reason why trying to deal with any aspect of stocks through the FMCT is not likely to be at all productive. It will be far less easy to persuade India, Israel and Pakistan to accept an FMCT covering stocks than one that covers only future production. The fact is that these States have refused to become parties to the NPT as non-nuclear weapon States for many decades—precisely, we must assume, because they have wanted to retain the right to produce unsafeguarded fissile material, for reasons we can all imagine. Those reasons endure. They will make it hard enough to persuade these three States to enter into commitments not to produce any more unsafeguarded fissile material, let alone to accept safeguards on their stocks of such materials. In framing our ambitions for the FMCT, we must, therefore, be realistic about what these three States may ultimately be persuaded to accept.

Where do all these points about "stocks" lead? To the conclusion that by getting bogged down in the marshy swamp of "stocks", there is a danger of not realising the very substantial benefits that can still flow from an FMCT dealing only with "future production". Those benefits are sometimes disparaged.

We have heard it said that the FMCT is unnecessary because the nuclear weapon States have already said they have ceased the production of fissile material for use in nuclear explosives. France, Russia, the United Kingdom and the United States have indeed made such statements. A universal and verifiable FMCT, however, would formalise and verify those statements. It would also bring in the other nuclear weapon State, China. And it would put constraints on the ability of India, Israel and Pakistan to produce more unsafeguarded fissile material. Those would be important accomplishments.

An FMCT that is limited to "future production" will also do much more than this. It will put in place an essential foundation for the eventual achievement of nuclear disarmament. Clearly there can be no final achievement of this goal without verification arrangements on all the key facilities that can produce fissile material suitable for use in nuclear explosives—enrichment and reprocessing facilities. Whatever else an FMCT may or may not do, it would certainly have to involve applying verification arrangements to all such facilities. The FMCT will put in place an essential prerequisite for the achievement of nuclear disarmament.

Our contention, therefore, is a simple one. The idea of an FMCT dealing with "stocks" will lead us into a morass of difficulties that will soon put in jeopardy the achievement of any FMCT. It seems unwise, to risk this when a universal and verifiable FMCT dealing just with "future production" will bring many major benefits.

What Will Such an FMCT Involve?

Moving from the why of an FMCT to the *what* takes in the question of what an FMCT dealing with "future production" will involve, particularly the question of verification arrangements.

This question is effectively about what verification arrangements should be accepted by those FMCT parties that are *not* non-nuclear weapon States parties to the NPT. Arrangements already accepted by the non-nuclear weapon States parties to the NPT, in order to verify their obligations under that Treaty, will almost certainly be deemed sufficient to verify their obligations under an FMCT, although this might need review in the light of the outcome of the IAEA's "93+2" programme.

The IAEA produced a very interesting study on this topic at a seminar on the FMCT in Canada in January 1995. It set out a variety of ways in which an FMCT might be verified. The main conclusion we drew from it was that the fundamental choice we face is between what we will call the "focused approach" and the "more sweeping approach".

In essence, the focused approach would involve applying safeguards to all reprocessing and enrichment facilities. It would also involve applying safeguards to all the separated plutonium and highly enriched uranium produced by these facilities after the cut-off date—as it moves out of those facilities into stores, fuel fabrication plants, fresh fuel stores, and reactors burning plutonium or highly enriched uranium fuels. But, the focused approach would not involve applying safeguards to natural and low-enriched uranium fuels or to any kind of spent fuel. By contrast, the essence of the more sweeping approach is that it would involve applying safeguards on natural and low-enriched uranium fuels and on any kind of spent fuel—as well as on those materials covered by the focused approach.

Thus, the more sweeping approach is much closer than the focused approach to the comprehensive arrangements that non-nuclear weapon State parties to the NPT already accept under that Treaty. Consequently, it will be no surprise if these States press for the more sweeping approach to verification to be adopted under the FMCT. It would have to be acknowledged—as the IAEA paper did—that in strict verification terms it probably is the better approach. After all, that is why we have the comprehensive approach under the NPT.

In the FMCT context, however, there are some other important points to consider in relation to the focused approach:

(a) Some of the potential FMCT parties that are not non-nuclear weapon States parties to the NPT may be more readily persuaded to accept the focused approach than the more sweeping approach.

(b) While operators in the United Kingdom and France have much experience of international safeguards and inspections, we are not sure this is so true of operators in some of the other potential parties, and in these circumstances it may be easier to achieve rapid implementation of the focused approach than of the more sweeping approach.

(c) As the IAEA paper clearly suggested, the focused approach, although itself by no means cheap, is likely to be a good deal less expensive than the more sweeping approach.

There are, therefore, a variety of points that will need careful thought when considering the advantages and disadvantages of the two main approaches to verifying an FMCT. The choice between these two approaches is the key one in the verification area. But, there are other important verification issues that will also require attention. I would like to highlight two.

The first concerns the possibility that an FMCT party might want to use some fissile material produced after the cut-off date for a non-explosive military purpose, such as naval propulsion. It will be recalled that the NPT does not prevent non-nuclear weapon States from using nuclear material in this way—and that, in a carefully circumscribed fashion, their NPT safeguards agreements provide for the non-application of safeguards to nuclear material when it is being used for such a purpose. As far as I am aware, that provision has- never been exercised by any non-nuclear weapon State, but the issue it is designed to deal with will also need dealing with in the FMCT.

So far, we have only been talking about the verification arrangements for declared facilities and material. The second point on verification is that any FMCT will also need to address what arrangements there should be for seeking out undeclared enrichment and reprocessing facilities and any fissile material they produce after the cut-off date that subsequently goes missing. This is not a small subject—and one that is likely to take us into the familiar but difficult territory of non-routine inspections.

Other detailed verification issues will arise when negotiations actually begin on an FMCT. Complex questions will face us in this area. Verification arrangements are the guts of *what* the FMCT will involve.

When shall we negotiate an FMCT?

The *when* of an FMCT brings us to the vexing subject of when we shall be allowed to start negotiations.

It is a matter of regret to my Government that negotiations for an FMCT have not yet started in the CD. General Assembly resolution 48/75 L, calling for such a treaty, was adopted without a vote in 1993. The mandate for an ad hoc committee to negotiate such a treaty was agreed unanimously in March 1995. Negotiations have yet to start.

The reason is well-known. Some of the states that supported that resolution and that mandate are now saying that they can no longer agree to an ad hoc committee on the FMCT unless an ad hoc committee is also set up to negotiate a time-bound framework for nuclear disarmament. We explained fully to the CD on 21 January why the United Kingdom does not believe this is the right way to make progress towards the goal of nuclear disarmament that we all share.

The United Kingdom, and all the nuclear weapon States, has been ready to negotiate an FMCT since 1993. We were asked for many years to do this. Though some time ago we said: "Yes, we will do it," it seems that some people cannot take "yes" for an answer. They have resorted instead to the old game of those who do not really want to make any progress at all, *linkage*—a simple but treacherous concept, enabling those who insist upon it to champion nuclear disarmament while in practice preventing useful steps towards it.

And let there be no mistake about it; that is what is being done. So long as there is no start to negotiations, there can be no resolution of the verification issues just identified. So long as there is no resolution of these issues, there can be no conclusion of a treaty that, as demonstrated earlier, will be an important step towards the final achievement of nuclear disarmament—indeed, a prerequisite for it.

For those reasons, we hope the nay-sayers will soon have a change of heart. If they do not, then, regrettably, so be it. If they do, we remain as ready to enter these negotiations now as we have been for over three years. In short, the *when* of the Treaty is a question that only the nay-sayers can now answer. As far as we are concerned, now is the time.

Conclusion

In sum, we have dealt with the three pivotal issues on the FMCT. First, there is a great deal to be said for concentrating on an FMCT that deals just with future production. Second, there are a range of complex verification issues that will need to be resolved before we can conclude such a treaty. And third, it is high time the CD began negotiating this treaty.

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