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Disarmament Decade, Outer Space and International Law

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I. A century of the arms race

The origin of the modern arms race has been traced to the Franco-Prussian war of 1870, when the French army of professionals, equipped with inferior iron guns, succumbed to the Prussian conscripts and the Krupp field guns made of steel.[1] In the aftermath several nations decided to introduce conscription and to provide their forces with new weapons. The inevitable result was a large increase in the size of national armed forces and rapid growth of the armaments industry. As Noel-Baker notes, between 1875 and 1914 "no industry in the world grew so fast as the production of arms, and no other investment held such glittering prospect of quick and large returns."[2] To make future wars more "humane", rather than to restrict competition in arms growth, the Hague Peace Conferences of 1899 and 1907 sought to regulate the use of some instruments of violence and to outlaw new weapons such as toxic gases and expanding bullets.[3] Of course, this modest attempt to introduce a measure of restraint in the production of arms failed to prevent the outbreak of World War I or to mitigate its destructiveness. The war encouraged immense growth in the armaments industry and led to the deployment of new weapons, such as

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[1] Noel-Baker, "We Have Been Here Before", in Calder, *Unless Peace Comes* (1968), 215, 219. Lord Noel-Baker was awarded the Nobel Prize for Peace in 1959.

[2] *Ibid.*

[3] For a summary of the achievements of the Hague Conferences, see McDougal & Feliciano, *Law and Minimum World Public Order* (1961), 617-24.

tanks, submarines, and aircraft, and to great technological improvements in all instruments of violence. Some eleven million deaths and the incalculable destruction caused by this conflict resulted in a renewal of efforts to reduce armaments and even to outlaw war as a means of settling international disputes. Unfortunately, they were ineffectual: the creation of the League of Nations,[4] the *Kellogg-Briand Pact* of 1928 (through which all the major powers renounced war as an instrument of national policy), the Geneva Disarmament Conference of 1932 (which gave birth to the idea of "general and complete disarmament"), and the various arms-limitation agreements concluded in direct response to the carnage (*e.g.*, the unratified *Washington Naval Agreement* of 1922) all proved incapable of preventing the arms race which culminated in the Second World War.

Ignoring the demands of public opinion, the leading powers of the time showed little enthusiasm for stopping the arms race, much less for beginning effective disarmament. The appalling losses borne in the Great War, and the solemn pledges to disarm, were forgotten and forsaken in the pursuit of "national security". Yet, for more than a decade after the Armistice of 1918, there was no immediate threat to the victors' security:

> The German, Austro-Hungarian and Turkish Empires had been broken up; Russia was no menace — she was left prostrate by war, revolution, civil war, famine and disease; but the victorious Allies went on with competitive warlike preparations — against each other. The numbers of their men under arms, and their military budgets reckoned at 1914 prices, never fell below the level they had reached in 1914, at the climax of the pre-war competition. They went on "improving" the quality of their arms.[5]

The arms race was clearly gaining a self-propelling momentum, and those who advocated its cessation or questioned its wisdom were usually rebuffed with a reminder that potential adversaries were arming faster. A contemporary observer reported that "[i]f budget appropriations were ever questioned in the British Parliament, Ministers (of all parties) ... answered by saying that France and the United States were spending more; the French and United States legislators accepted similar replies as final."[6]

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[4] Art. 8 of the *Covenant of the League of Nations* explicitly acknowledged that "the maintenance of peace requires the reduction of national armaments to the lowest point consistent with national safety and the enforcement by common action of international obligations."

[5] Noel-Baker, *The Arms Race: A Programme for World Disarmament* (1958), 43-4.

[6] *Ibid.*, 44.

With growing great-power rivalry, it was only a question of time before another major conflict would erupt. During the Second World War, in less than six years of conflict, some fifty million lives were lost and many areas of Europe and Asia lay in ruins, as new and more efficient methods of killing and destruction were employed by the combatants. Finally, on August 6, 1945, a weapon of unprecedented power, the atomic bomb, was detonated over Hiroshima. It was soon to be known as the "ultimate" weapon which could destroy civilization.

General revulsion against a second carnage within a single generation gave new impetus to aspirations for a system of world order in which armaments would be limited and the use of force strictly controlled.[7] Disarmament became one of the principal aims of the United Nations, in accordance with the Preamble of the Charter which proclaims the determination of member states to save succeeding generations from the scourge of war. According to article 1(1) of the Charter, the first objective of the organization is "to maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace." Under articles 11, 26 and 47, the Charter entrusts particular responsibilities for disarmament to the General Assembly and the Security Council.

The very first resolution of the General Assembly, adopted on January 24, 1946,[8] dealt with the question of disarmament and, specifically, with the urgent need to eliminate atomic weapons and all other weapons of mass destruction from national armouries. At the same session, the General Assembly recognized in Resolution 41[I] the central role of disarmament in the maintenance of world peace and security.[9] In the same year, before any progress on arms limitation could be achieved, the great ideological confrontation between the communist and the western powers had begun. One of its first casualties was the so-called "Baruch Plan", the American

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[7] President Roosevelt and Prime Minister Churchill included among the principles of the *Atlantic Charter* (signed Aug. 14, 1941) the employment of "measures which will lighten for peaceloving peoples the crushing burden of armaments." For the full text of the Charter, see Whiteman, *Digest of International Law* (1965), Vol. 5, 18-9.

[8] U.N. Doc. A/64, Res. 1[I] (1946). The resolution established a "Commission to deal with the problems raised by the discovery of atomic energy" and charged it to make specific proposals, *inter alia*, "for control of atomic energy to the extent necessary to ensure its use only for peaceful purposes" and "for the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction."

[9] U.N. Doc. A/64/Add.1, Res. 41[I] (1946), adopted on Dec. 14, 1946.

proposal for placing all of the world's atomic resources, including atomic weapons, under the ownership or control of an international authority.[10] Soon the Cold War was in full swing, stimulated by a virtually unrestricted arms race and spiralling defence budgets.

The universal fear of nuclear weapons and of their proliferation, reflected in the stream of resolutions from the General Assembly, was responsible for generating enough public pressure to force the governments of major powers to continue, however hesitantly, bilateral and multilateral negotiations for the limitation of arms. In the late 1950's and early 1960's, during a frenetic cycle in arms growth which was highlighted by numerous tests of large nuclear weapons and rockets for their delivery, the United States and the Soviet Union found it desirable to exchange comprehensive proposals for a treaty on "general and complete disarmament".[11] Encouraged by these symbolic gestures, the General Assembly, in Resolution 1378 (XIV), unanimously adopted on November 20, 1959, expressed the hope that measures leading towards the goal of general and complete disarmament under effective international control would be worked out and agreed upon in the shortest possible time.[12] Two decades later, and after the expenditure of at least 3.5 trillion dollars on armaments, the prospects of agreement in the foreseeable future on general and complete disarmament are extremely unpromising. While General Assembly resolutions are passed annually to remind governments of this ultimate objective, major powers have long since abandoned this goal and have preferred to negotiate specific and partial measures of arms control. The shift in objectives is apparent in the substitution of the term "disarmament" by terms such as "arms control" and "arms limitation".[13]

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[10] U.S. Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements: Texts and History of Negotiations* (1977), 4-5. See also United Nations, *The United Nations and Disarmament 1945-1970* (1970), 12-24.

[11] *Ibid.*, 78-101. An excellent account of various proposals made between 1945 and 1960 appears in Bechhoefer, *Postwar Negotiations for Arms Control* (1961). For comparative text of the U.S. and Soviet "comprehensive" disarmament plans as they stood in Feb., 1964, before being discarded, see Gotlieb, *Disarmament and International Law* (1965), 174-96.

[12] U.N. Doc. A/Res./1378 (XIV).

[13] According to a short definition offered by Hedley Bull, arms control is "restraint internationally exercised upon armaments policy, whether in respect of the level of armaments, their character, deployment or use" (*The Control of the Arms Race*, 2d ed. (1965), vii). In a study prepared by two early advocates of arms control, the term has been explained as follows: "[a]ll the forms of military cooperation between potential enemies in the interest of reducing the likelihood of war, its scope and violence if it

Within the framework of bilateral Soviet-American "Strategic Arms Limitation Talks" (SALT),[14] limited success has been achieved in curbing the arms race in the area of major strategic weapons. However, many disarmament experts are of the opinion that the partial arms-control measures pursued by the major powers have actually helped to escalate the arms competition in new directions.[15] It is difficult not to agree with this assessment when one

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occurs, and the political and economic costs of being prepared for it. The essential feature of arms control is the recognition of the common interest, of the possibility of reciprocation and cooperation between potential enemies with respect to their military establishments [:] ... arms control may cost more not less. It may by some criteria seem to involve more armament not less" (Shelling & Halperin, *Strategy and Arms Control* (1961), 2). The concept of "disarmament", on the other hand, covers any or all of the following measures: a reduction of military manpower, weapons of war (*e.g.*, aircraft, tanks, submarines, ballistic missiles), aggregate explosive power, military budgets, elimination of a particular weapon (*e.g.*, biological and toxin agents), and so forth. Disarmament may be unilateral or multilateral; general or regional; comprehensive or partial; controlled or uncontrolled. See Bull, *supra.*

[14] For a survey of the negotiating history and the scope of SALT I and SALT II, see (1976) 1 *The United Nations Disarmament Yearbook,* 148-58; (1977) 2 *The United Nations Disarmament Yearbook,* 79-94; (1978) 3 *The United Nations Disarmament Yearbook,* 185-96. A comprehensive account of the negotiations leading to SALT I and an examination of the treaty and related accords appears in Willrich & Rhinelander, *SALT: The Moscow Agreements and Beyond* (1974). For a compelling analysis of post-World War II disarmament efforts, see Myrdal, *The Game of Disarmament: How the United States and Russia Run the Arms Race* (1977).

[15] See, *e.g.*, Barnaby, *World Arsenals in 1978* 35 Bull. Atom. Scientists (Sept., 1979), 18; Jensen, *Two Years After Vladivostok — Is SALT Worth Its Salt?* Int'l Perspectives (Jan.-Feb., 1977), 17. See also *Declaration on the Nuclear Arms Race,* signed in Dec. 1977 by 12,700 American scientists, engineers and other professionals (text in 34 Bull. Atom. Scientists (March, 1978), 8); Kistiakowsky, *The Good and the Bad of Nuclear Arms Control Negotiations* 35 Bull. Atom. Scientists (May, 1979), 7. Dr Herbert F. York, formerly a high U.S. defence official and currently U.S. representative to the Comprehensive Test Ban negotiations, makes a pertinent point in reference to the effect on the arms race of the *Limited Nuclear Test Ban Treaty* of 1963. While the Treaty did stop harmful fallout, he notes, it failed to end testing: "In fact, the rate of testing has actually increased. The partial nuclear test ban has thus turned out to be not a disarmament measure, but the first environmental control measure. Worse, by eliminating fallout it eliminated public interest in the subject. Fallout produced a wide-spread concern in the arms race and created for a brief time a substantial constituency vitally interested in one element of arms control. By eliminating fallout, we eliminated this constituency. By continuing and even expanding testing we have undercut any moral or political arguments we might make against testing by others." In Dr York's view, unless a certain measure

contrasts the number of arms-control agreements concluded to date with the diversity, quantity and sophistication of current strategic *and* conventional armaments.

A catalogue of the more significant agreements in the field of armaments includes:[16]

Multilateral Agreements

1. *The Antarctic Treaty* (1959), prohibiting any measures of a military nature in the Antarctic;
2. *The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water* (1963);
3. *The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies* (1967) [hereinafter *Outer Space Treaty*], banning the stationing in outer space of nuclear or any other weapons of mass destruction;
4. *The Treaty for the Prohibition of Nuclear Weapons in Latin America* (1967);
5. *The Treaty on the Non-Proliferation of Nuclear Weapons* (1968);
6. *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 Sub-soil Thereof* (1971);
7. *The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction* (1972);
8. *The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques* (1977);

Bilateral Agreements between the U.S. and the U.S.S.R.

1. *The Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War Between the U.S.A. and the U.S.S.R.* (1971), providing for immediate notification should a risk of nuclear war arise from detection of unidentified objects on early warning systems, or from any accidental, unauthorized, or

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of arms control is followed by another, aimed at reversing the momentum of arms competition, the gains will be minimal, or matters can even be made worse ("A Little Arms Control Can be a Dangerous Thing" in Beitz & Herman, *Peace and War* (1973), 257, 262-3).

[16] For the texts of these agreements, see *Arms Control and Disarmament Agreements, supra,* note 10.

other unexplained incident involving the possible detonation of a nuclear weapon;

2. *The Treaty Between the U.S.A. and the U.S.S.R. on the Limitation of Anti-Ballistic Missile Systems* (1972);
3. *The Interim Agreement Between the U.S.A. and the U.S.S.R. on Certain Measures With Respect to the Limitation of Strategic Offensive Arms* (1972);
4. *The Agreement Between the U.S.A. and the U.S.S.R. on the Prevention of Nuclear War* (1973), providing for urgent consultations between the parties should they find themselves in a nuclear confrontation;
5. *The Treaty Between the U.S.A. and the U.S.S.R. on the Limitation of Underground Nuclear Weapons Tests* (1974), prohibiting tests having a yield exceeding 150 kilotons;
6. *The Protocol to the Treaty Between the U.S.A. and the U.S.S.R. on the Limitation of Anti-Ballistic Missile Systems* (1974), restricting each power to one ABM site only.

These multilateral and bilateral agreements are all in force.[16a] The most recent addition to this list is *The Treaty Between the U.S.A. and the U.S.S.R. on the Limitation of Strategic Offensive Arms,* signed in Vienna on June 18, 1979 after almost seven years of negotiations.[17] The essential provisions of the Treaty limit each side to a total of 2,250 strategic-weapon delivery systems of any kind, including land-based intercontinental ballistic missile (ICBM) launchers, submarine ballistic missile launchers (SLBM) and heavy bombers. The overall ceiling permits each side a maximum of 1,320

[16a] On Oct. 10, 1980 a United Nations conference held in Geneva adopted the text of the *Convention on Prohibitions or Restrictions on the Use of Specific Conventional Weapons,* with three protocols. In terms of disarmament these instruments add very little, their main purpose being to protect civilians in time of armed conflict against certain more inhumane methods of conventional warfare. The Convention and its protocols will be opened for signature on April 10, 1981. For the text see U.N. Doc. A/Conf. 95/14/Add. 1 (Oct. 10, 1980).

[17] The text of the SALT II Treaty and Protocol, with related documents, appears in 79 Dep't State Bull. (July, 1979), 23 and in (1979) 18 Int'l Leg. Mat. 1112.

In the shadow of SALT, negotiations on the "mutual and balanced force reduction" (MBFR), an arms-control initiative confined to Europe, began in Nov., 1973. The declared purpose of these negotiations, conducted between NATO and Warsaw Pact member states, is to find a way to reduce active duty air and ground forces on each side of East-West boundaries and thereby enhance military stability in central Europe. After seven years of talks, no agreement is in sight. See *Mutual and Balanced Force Reduction Talks* 79 Dep't State Bull. (Feb., 1979), 43.

ICBM's and SLBM's with multiple warheads (MIRV's) and heavy bombers with cruise missiles; the number of multiple warheads on missiles is restricted to the number already tested, that is, a maximum of ten on land-based weapons (the number on the operational Soviet heavy ICBM) and fourteen on weapons based on submarines (the number already deployed by the United States).[18]

Even if approved in its present form by the U.S. Senate, the SALT II agreement would not accomplish much genuine disarmament. With the exception of 250 ageing strategic missiles which, under the treaty, the Soviets must dismantle, both sides reserve the right to continue their programmes of improving national strategic arsenals. By 1985, when the Treaty expires, each would have significantly increased its destructive capability. As President Carter said, the SALT II agreement would "permit us and our allies to pursue all the defense programs we believe we may eventually need — the MX missile; the Trident submarine and missiles; air, ground and sea-launched cruise missiles; cruise missile carrier aircraft; and a new penetrating bomber."[19] It should also be noted that neither the SALT treaties nor the multilateral arms-control agreements mentioned above limit the development and deployment of so-called conventional weapons. In fact, none of these agreements, much like those concluded decades before, has led to the abolition of any weapon which has been considered useful by the military. The observation made in 1961 by McDougal and Feliciano is still valid:

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[18] Useful discussion of the military and political aspects of SALT II negotiations can be found in Scoville, *The SALT Negotiations* Scientific American (Aug., 1977), 24; Lodal, *SALT II and American Security* (1978) 57 Foreign Aff. 245; Kistiakowsky, *False Alarm: The Story Behind SALT II*, N.Y. Rev. of Books (March 22, 1979), 33; Trofimenko, *SALT II: a Fair Bargain* 35 Bull. Atom. Scientists (June, 1979), 30; Mandelbaum, *In Defense of SALT* 35 Bull. Atom. Scientists (Jan., 1979), 15; Rostow, *The Case Against SALT II* Commentary (Feb., 1979), 23; Falk, *Surviving SALT II* The Nation (Oct. 27, 1979), 391; Pavlov & Karenin, *SALT 2 — Its Content and Importance* Int'l Affairs [Moscow] (Nov., 1979), 25. For the position of U.S. Government, see the statement by George M. Seignious II, Director of the Arms Control and Disarmament Agency, *Arms Control: An Evaluation of Salt II* 79 Dep't State Bull. (Oct., 1979), 25.

[19] Address at the Georgia Institute of Technology (N.Y. Times (Feb. 21, 1979), A-4, col. 5). The future of SALT II is bleak. In response to Soviet invasion of Afghanistan, President Carter on Jan. 3, 1980 formally requested the U.S. Senate to delay consideration of the Treaty until he can assess Soviet actions and intentions: for full text of the President's request, see 80 Dep't State Bull. (Feb., 1980), 12. On the prospects to contain U.S.-Soviet military competition in the light of recent political developments, see Blechman, *Do Negotiated Arms Limitations Have a Future?* (1980) 59 Foreign Aff. 102.

> Weapons parity may of course in particular situations induce reciprocal abstinence, but in general only weapons which were militarily ineffective or inefficient, or which were of marginal or indecisive military value and obsolete, or which were not deemed vital to the military establishments of one or more great powers, have been successfully prohibited.[20]

In 1969, the continuing and spreading nuclear and conventional arms race led the Secretary-General of the United Nations to propose to member states that the 1970's be dedicated a "Disarmament Decade".[21] The proposal was widely welcomed and the General Assembly did so declare the Disarmament Decade on December 16, 1969.[22] The resolution also recommended that consideration be given to channelling a substantial part of the resources freed by measures in the field of disarmament to promoting economic development in developing countries, and particularly their scientific and technological progress. As it happens, the Disarmament Decade was largely ignored. Indeed, few issues in the past decade have received less attention or publicity than disarmament. The conspiracy of silence, interrupted once a year during the ritual passing of another General Assembly resolution on disarmament, has been almost totally successful. Colossal indifference and profound cynicism marked the attitude of the majority of member states towards both the idea and the objectives of the Disarmament Decade. The disappointing results of the Secretary-General's initiative have been summarized as follows in the *Final Document of the Tenth Special Session of the General Assembly:*

> The Disarmament Decade solemnly declared in 1969 by the United Nations is coming to an end. Unfortunately, the objectives established on that occasion by the General Assembly appear to be as far away today as they were then, or even further because the arms race is not diminishing but increasing and outstrips by far the efforts to curb it. While it is true that some limited agreements have been reached, "effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament" continue to elude man's grasp. Yet the implementation of such measures is urgently required. There has not been any real progress either that might lead to the conclusion of a treaty on general and complete disarmament under effective international control. Furthermore, it has not been possible to free any amount, however modest, of the enormous resources, both material and human, which are wasted on the unproductive and spiralling arms race and which should be made available for the purpose of economic and social development, especially since such a race "places a great burden on both the developing and the developed countries".[23]

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[20] *Law and Minimum World Public Order* (1961), 617.
[21] (1976) 1 *The United Nations Disarmament Yearbook,* 15.
[22] U.N. Doc. A/Res./2602 E (XXIV).
[23] U.N. Doc. A/Res./S-10/2 (July 13, 1978), 3.

During the Disarmament Decade annual military expenditures throughout the world more than doubled, reaching the staggering figure of 434 billion dollars in 1977; in 1980 these expenditures are expected to exceed 500 billion dollars.[24] Moreover, a large and growing number of developing countries, countries that can least afford it, have joined the global arms race, thereby complicating the already difficult process of disarmament negotiations. And although mankind has so far avoided a third world war, which by all sensible estimates would mean the end of civilization, the record of disarmament and non-violent settlement of disputes has been dismal since 1945. More than twenty-five million people have died in 133 "peripheral" wars; millions of refugees have been created and whole countries have been devastated.[25] The number of nations with nuclear weapons has grown to six, possibly seven if Israel is included,[26] with many more able to enter the nuclear "club" within a short period, should they so decide. Some thirty-six million men are today under

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[24] The estimate for 1980 is from Barnaby, *World arsenals in 1980* 36 Bull. Atom. Scientists (Sept., 1980), 9. The amount for 1977 is given in U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers 1968-1977* (1979), 1. In a statement to Committee I of the U.N. General Assembly on Oct. 18, 1979, George M. Seignious II, Director of the U.S. Arms Control & Disarmament Agency, increased the figure to $450 billion *per* year (80 Dep't State Bull. (Jan., 1980), 54).

[25] The Third World countries, excluding China, accounted in 1978 for about 14% of world military spending. Their military budgets have not only doubled during the 1970's but have grown faster than the gross national product. It is estimated that these countries spend three times more on the military than they receive in development aid (Barnaby, *supra*, note 15). Between 1958 and 1978, Iran alone had spent $36 billion on modern weaponry (Time (Nov. 27, 1978), 26). See the excellent study prepared for the U.N. Secretary-General, *Economic and Social Consequences of the Arms Race and of Military Expenditures* (1978). See also Pierre Elliott Trudeau, Prime Minister of Canada, address before the Tenth Special Session of the U.N. General Assembly on Disarmament, May 26, 1978 (Canadian Delegation to the United Nations, *Communiqué* (mimeograph)), and Bauer & Ripka, *Is This Peace?* 34 Bull. Atom. Scientists (June, 1978), 15.

[26] In the spring of 1976, U.S. media reported that, according to the Central Intelligence Agency's estimates, Israel had between 10 and 20 nuclear weapons, each of a 20-kiloton yield, ready for use (N.Y. Times (March 16, 1976), A-1, col. 2; Time (April 12, 1976), 21). There is a growing suspicion that South Africa, Pakistan, Brazil and Argentina are surreptitiously working on the development of nuclear weapons (N.Y. Times (Aug. 17, 1979), A-6, col. 3 (Pakistan); N.Y. Times (Oct. 26, 1979), A-1, col. 5 (South Africa); Maclean's (Dec. 3, 1979), 34 (Brazil and Argentina)). See also Khalilzad, *Pakistan and the Bomb* 36 Bull. Atom. Scientists (Jan., 1980), 11; Newsweek [Int'l Ed.] (Sept. 15, 1980), 20-5.

arms in regular and para-military forces and another thirty million civilians in military-related occupations;[27] an estimated 500,000 engineers and scientists are working on projects which annually absorb thirty billion dollars for weapons research and development — more than is spent globally for research on energy, health, education and food combined;[28] and new weapons have been developed which either threaten the existing precarious strategic balance (*e.g.*, super-accurate intercontinental missiles with multiple, independently targetable nuclear warheads, long-range cruise missiles and a mobile medium-range ballistic missile — the SS-20), or make the employment of nuclear weapons in a "limited" war more acceptable and therefore more likely (*e.g.*, the neutron battlefield weapon).[29]

As will be documented more fully later, the expanses of outer space, accessible only since 1957, have also been added to the arenas of arms competition. Space technology, one of the greatest achievements of human genius, with immense potential for the enrichment of all mankind, is increasingly being used for purposes which at best serve the narrow power interests of a few states to the detriment of the world community:

> [P]otentially the deadliest and costliest arms race in history is rapidly building momentum. Quietly and relentlessly, the U.S. and the Soviet Union are rushing to develop sophisticated new weapons that will revo-

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[27] Robert S. McNamara, former U.S. Secretary of Defence and retiring President of the World Bank, in a speech at the University of Chicago as reported in N.Y. Times (May 23, 1979), A-21, col. 3, and N.Y. Times (May 25, 1979), A-29, col. 4.

[28] *Ibid.*

[29] See, *e.g.*, Barnaby, *supra*, note 15, 23-4; Tsipis, *Cruise Missiles*, Scientific American (Feb. 1977), 20; *Special Report: The first nuclear war conference* 35 Bull. Atom. Scientists (April, 1979), 20, 23; Kistiakowsky, *The Folly of the Neutron Bomb* 34 Bull. Atom. Scientists (Sept., 1978), 25. The risks of an all-out nuclear war have been significantly augmented by the recent adoption of Presidential Directive 59, which appears to substitute a nuclear war-fighting strategy ("countervailing strategy") for the deterrent strategy. The essence of the new strategy, as described by Secretary of Defence Harold Brown, is as follow: "it is crucial that the Soviet leadership recognize that by aggression they would risk not only a general U.S. retaliation on the full range of targets; they must also understand that if they choose some intermediate level of escalation, the U.S. could by more limited responses impose on the Soviets an unacceptably high cost in terms of what the Soviet leadership values most — political and military control, military power both nuclear and conventional, and the industrial capacity to sustain military operations" (N.Y. Times (Aug. 11, 1980), A-9, col. 1). See also N.Y. Times (Aug. 13, 1980), A-3, col. 3.

> lutionize the concept of modern warfare and turn outer space into another armed camp.[30]

According to Paul C. Warnke, former head of the U.S. Arms Control and Disarmament Agency, "we could have war in space within a decade unless we devise a treaty that will stop it."[31]

It was in these inauspicious circumstances, "alarmed by the threat to the very survival of mankind posed by ... the continuing arms race",[32] that in May and June, 1978 the General Assembly of the United Nations met in its special session on disarmament. Attended by almost all member nations, many of them represented by head of state or head of government, the Special Session reviewed the meagre achievements for the control of the arms race, agreed that the accumulation of armaments is wasteful and detrimental to international security, reorganized the U.N. disarmament machinery and procedures, adopted a "Declaration" and an ambitious "Program of Action", and reaffirmed the determination of the member states to work for general and complete disarmament. Whether this latest attempt to end the escalation will be more productive than previous efforts is at best uncertain.[33] The first session of the newly established U.N. Disarmament Commission (UNDC), held in May and June, 1979, revealed neither a sense of urgency nor a strengthened commitment to the goals of arms reduction in participating states. After a month of deliberations, the UNDC agreed on the text of the "Elements of a Comprehensive Programme of Disarmament", which only slightly expands on the *Final Document of the Special Session.*[34] The meeting failed to achieve any break-

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[30] *The New Military Race in Space* Business Week (June 4, 1979), 136. A comprehensive and well-documented account of the military uses of outer space appears in Stockholm International Peace Research Institute, *Outer Space — Battlefield of the Future* (1978) [hereinafter cited as SIPRI]. For a thorough evaluation of the Soviet effort to 1975, see Staff Report prepared for the use of the Senate Committee on Aero. & Space Sciences, *Soviet Space Programs, 1971-75: Goals and Purposes, Organization, Resource Allocations, Attitudes toward International Cooperation and Space Law* (1976), Vol. 1, 375-478 [hereinafter cited as *Soviet Space Programs*]. For an update, see Sheldon, *The Soviet Space Program in 1979* Air Force Mag. (March, 1980), 88.

[31] Business Week, *supra*, note 30.

[32] From the preamble of the *Final Document of the Tenth Special Session of the General Assembly, supra*, note 23.

[33] The credibility of the Special Session was not enhanced by the decision of the leaders of the NATO countries to go directly from the U.N. disarmament conference into a private conclave in Washington where they proceeded to urge one another to increase their national armaments budgets.

[34] For the full text of the "Elements of a Comprehensive Programme of Disarmament", see U.N. Doc. 34 GAOR, Supp. No. 42, *Report of the Disarmament Commission* (1979), 8.

through on disarmament and even had difficulties in maintaining a consensus on certain issues agreed upon at the Special Session. Similarly unpromising has been the inaugural meeting of the new U.N. Committee on Disarmament, created by the 1978 Special Session as a negotiating forum with limited membership (consisting of five nuclear-weapon states and thirty-five others).[35]

In the meantime, the arms race moves relentlessly on. National defence establishments and the weapons industry continue to enjoy unprecedented prosperity,[36] with few governments showing any serious intention to reverse the trend. Encouraged in part by genuine concerns for security and increasingly by powerful special interests, the arms race has become a way of life and a source of livelihood for millions, as well as a state of mind from which no governing elite seems capable of liberating itself.

II. The militarization of outer space

Three years after the beginning of the space age, President Eisenhower warned the U.N. General Assembly that it faced a vital decision:

> Will outer space be preserved for peaceful use and developed for the benefit of all mankind? Or will it become another focus for the arms race — and thus an area of dangerous and sterile competition? The choice is urgent.[37]

During the intervening two decades, despite Eisenhower's warning, outer space has been transformed into a new arena of the global arms competition. Public inattention to this aspect of the arms race may be attributed in part to the fact that the full scope of current military activities with ramifications for the use of outer space is uncertain, and to the fact that the true nature of many objects launched into orbit is often unknown.[38] Reports on launchings,

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[35] U.N. Doc. 34 GAOR, Supp. No. 27, *Report of the Committee on Disarmament* (1979).

[36] The growing influence of the arms lobby and its business methods are ably analyzed in a well-documented study by Sampson, *The Arms Bazaar* (1978). For purposes of comparison, see also Lapp, *The Weapons Culture* (1968), demonstrating that the "disarmament decade" has had at best only minimal impact on the frantic escalation of the arms race.

[37] Address given Sept. 22, 1960: see Senate Committee on Aero. & Space Sciences, *Statements by Presidents of The United States on International Cooperation in Space — A Chronology: October 1957 — August 1971*, S. Doc. No. 92-40, 92d Cong., 1st Sess. 16 (1971).

[38] "A tendency exists to underrate the degree in which outer space is still regarded as a medium for militaristic activities. In an article entitled 'The Great Competition in Space' [published in 1972] the writer, Sir Bernard

submitted by the Soviet Union and the United States to the U.N. Secretary-General, remain as uninformative under the *Registration Convention* of 1975[39] as they were under the earlier system of voluntary reporting established in 1961 by a resolution of the General Assembly.[40] If one were to accept uncritically the cryptic description of the objectives of each space mission as officially reported by the launching state, it would appear that both countries use outer space exclusively for non-military purposes. However, there is a difference in this respect between the two space powers. While the Soviet Union consistently eschews a public admission that any of its numerous satellites serve military functions, the American military effort in space is often discussed by government officials and is the subject of congressional hearings and commentaries in the media.[41] Recent Soviet-American negotiations on anti-satellite weapons illustrate well the Soviet tendency to deny its

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Lovell, refers to the unpalatable fact that at least half the space efforts of the two major Space Powers involved, lies in the military domain" (Goedhuis, "The Present State of Space Law" in International Law Association, *The Present State of International Law* (1973), 201, 203). According to a recent study prepared by the Stockholm International Peace Research Institute, "about 60 per cent of both the US and the Soviet satellites launched into orbit have been military satellites. Since the space age began, 1386 military satellites are known to have been launched by the end of 1976 — 563 by the USA, 899 by the USSR, 5 by the USA for the United Kingdom, 3 by the USA for France and 5 by France itself, 2 by China and 4 by the USA for NATO .... Up to the end of 1976, the USA had spent about $30,000 million on its military space activities, about one-third of the total sum spent on space. The cost of the Soviet military space programme is kept secret, but the magnitude of the effort is similar to that of the USA" (SIPRI, *supra*, note 30, v). The scope of the Soviet defence effort in outer space is explored at length in *Soviet Space Programs, supra*, note 30, 375-478.

[39] *Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. A/Res. 3235 (XXIX), annex, adopted Nov. 12, 1974. The Convention was opened for signature at New York on Jan. 14, 1975 and entered into force on Sept. 15, 1976. As of Dec. 1, 1978, the Convention was in force for 23 nations, including all the major powers except China. For the text and list of parties, see Senate Committee on Commerce, Science & Transportation, *Space Law: Selected Basic Documents*, 2d ed. (1978), 71. See also United Nations, *Space Activities and Resources*, U.N. Doc. A/AC.105/193, 201 (1977); Jasentuliyana & Lee, *Manual on Space Law* (1979), Vol. 2, 23.

[40] U.N. Doc. A/Res. 1721 (XVI), of Dec. 20, 1961. For details on reporting practices by the launching states, see text at note 175, *infra*.

[41] "There has always been an element of speculation about Soviet purposes in space because of their skillful use of information policies to combine a large flood of information about many aspects of space flight, including the quick identification of flight names and orbital parameters, and at the same time they have a policy of tight security and secrecy over the real purposes of most payloads and minimal information about the technology

participation in the space arms race. In accepting the American invitation to discuss a possible ban on such weapons, the Soviet government refused to acknowledge, at least publicly, its actual or potential anti-satellite capability.[42]

Nevertheless, overwhelming evidence reveals that the U.S.S.R. has been using satellite technology for military purposes almost since the beginning of the space age.[43] The perceived military potential of space technology was clearly reflected in the Soviet proposal to ban the use of outer space for military purposes, submitted in 1958 for the consideration of the U.N. General Assembly.[44] Indeed, both super-powers have been quick to realize that military advantages could be obtained from the use of new technology and, as a result, both have developed impressive arsenals of defence-oriented space systems in the past twenty years.[45] The diverse existing military uses of outer space are too well known to require detailed reiteration in this survey.[46] It should suffice to mention

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of Earth orbital flight" (*Soviet Space Programs, supra,* note 30, 375). However, as this Library of Congress study admits, the United States "remains at least as reticent as the Soviet Union in refusing to disclose real details about the central military missions in space, although we acknowledge we are withholding, while the Russians pretend they have no military space program to withhold" (*ibid.,* 376).

[42] See discussion in text at note 72, *infra.* In accord with this policy of total denial, the U.S.S.R. never revealed the true nature of its nuclear-powered satellite, Cosmos-954, which crashed on Canadian territory on Jan. 24, 1978. The satellite was widely believed to have been engaged in naval reconnaissance (N.Y. Times (Jan. 25, 1978), A-1, col. 6). After its launching on Sept. 18, 1977, the function of Cosmos-954 was officially reported by the Soviets as follows: "carrying scientific apparatus, radiosystem for precise measurements of orbital elements and radiotelemetry system" [*sic*] COSPAR Info. Bull. (April, 1978), 98). For text of the diplomatic notes exchanged between Canada and the Soviet Union concerning the Cosmos incident, see (1979) 18 Int'l Legal Mat. 899-930.

[43] See, *e.g.,* SIPRI, *supra,* note 30, 33. See also McDougal, Lasswell & Vlasic, *Law and Public Order in Space* (1963), 370 *et seq.,* and sources cited therein.

[44] Soviet draft resolution of Nov. 7, 1958, U.N. Doc., G.A. Verbatim Off. Rec., 13 Sess. 1st Comm. A/C.1/L.219 (1958).

[45] According to SIPRI, *supra,* note 30, 29, the planning and development of U.S. satellite reconnaissance programme began even before the advent of the space age, although the first American satellites specially designed for military surveillance were launched in 1959. A comprehensive catalogue of the U.S. and Soviet reconnaissance satellites placed in orbit between 1959 and 1976 covers fifty pages of the SIPRI report (*ibid.,* 49-96). See also Carroll, *Secrets of Electronic Espionage* (1966), 187-94.

[46] See sources cited in note 30, *supra.* See also the excellent recent survey by Scoville & Tsipis, *Can Space Remain a Peaceful Environment?* (Stanley

that by all accounts space-based military vehicles for purposes of surveillance, navigation, electronic intelligence, targeting, mapping, communications, weather-reporting, and warning against a surprise missile attack are fully operational. Each power has significantly integrated satellite technology into its military machine and made the functioning of its major strategic systems dependent in varying degrees on the space component. However, according to available information, all existing, *fully operational* (as opposed to experimental) military satellites are essentially of a non-offensive nature;[47] their function is not to attack, neutralize or destroy hostile targets, but to support and improve the performance of earth-bound forces. In recent years, however, defence technology and planning seem to have been moving increasingly towards the development of systems capable of attacking other spacecraft and possibly even terrestrial targets (including ships and submarines).

The conceptual prototype for this trend was a bomb-carrying satellite, a popular idea among some defence planners during the late 1950's and early 1960's.[48] With the development of heavy

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Foundation Occasional Paper No. 18, 1978); Bell, *America's Other Space Programs* The Sciences (Dec., 1979), 4.

[47] Although as early as Oct., 1977 the U.S. Secretary of Defence, Harold Brown, asserted that the Soviets possess "operational anti-satellite capability" against "some" spacecraft (U.S. Arms Control & Disarmament Agency, *Documents on Disarmament 1977* (1979), 609), the evidence supporting such claims, in the opinion of this author, is still inconclusive. Even *Aviation Week & Space Technology*, the leading journal of the American military aerospace industry, assessed the most successful among the Soviet anti-satellite tests merely as "possible success": see text at note 72, *infra*. If the U.S.S.R. indeed possesses an operational anti-satellite system, one wonders at the Soviet Union's failure to use this weapon against its own highly secret reconnaissance satellite, Cosmos-954, to prevent it from falling into American hands. It is hard to think, short of war in outer space, of a more compelling justification for the employment of the weapon. That the Soviet Union, as well as the United States, possesses the capability both to alter the orbits of its satellites and sometimes to lead them on collision course, has been fairly well documented; but proof of such capability does not make this space system "operational". While somewhat reluctantly accepting the soviet satellite "rendez-vous" experiments of 1976-77 as an indication of an existing anti-satellite programme, Scoville and Tsipis grant it "a very limited capability against U.S. space assets" (*supra*, note 46, 10). Herbert Scoville, Jr is former Deputy-Director of C.I.A. and Professor Kosta Tsipis is associate director of the Program in Science and Technology for International Security, Department of Physics, Massachusetts Institute of Technology.

[48] See, *e.g.*, Schelling, "The Military Uses of Outer Space: Bombardment Satellites" in Goldsen, *Outer Space in World Politics* (1963), 97; Brennan, "Arms and Arms Control in Outer Space" in Bloomfield, *Outer Space: Prospects for Man and Society* (1962), 123, 129-32.

rockets capable of lifting into space objects weighing several tons,[49] the prospect of placing nuclear bombs in orbit and detonating them over "enemy" territory was contemplated by some weapons experts as a serious possibility. For example, Professor Harrison Brown of the California Institute of Technology foresaw the possibility of orbiting nuclear devices of 1,000 megatons which could, on command, incinerate six Western states within minutes if exploded at an altitude of three hundred miles.[50] The concept of orbital nuclear bombers was eventually rejected as impractical and less efficient than the more conventional means of delivery, and since 1967 has been explicitly banned by article IV of the *Outer Space Treaty*.[51]

The fractional orbital bombardment system (FOBS), reportedly under development by the Soviet Union in the 1960's, could be regarded as the forerunner of a more sophisticated weapons system designed to operate from outer space. The system has been described by American sources as consisting of satellites armed with nuclear weapons which would, at a given signal, descend from orbit to strike a set target. According to one account, the FOBS satellite,

> by flying the long way around the world, arrives at its target "in exactly the opposite direction from which the principal defending radars have been pointed. For example, if the big defense radars are in the Arctic, and the missile comes to a U.S. target by way of Antarctica, the main defense system would miss it". FOBS can be called down in six minutes and "would not have to be large in number to destroy most of the available Strategic Air Command ... bases."[52]

Needless to say, the U.S.S.R. never confirmed that it was working on such a system, despite allegations by the American defence community that the Soviets had on more than one occasion conducted orbital tests of the FOBS spacecraft. If such experiments did indeed

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[49] The progression in weight-lifting capacity of rockets, since the early days of space flight, has been phenomenal. While the world's first satellite, the Soviet Sputnik, weighed a mere eighty-four pounds, U.S. Mercury spacecraft, launched into orbit on Feb. 20, 1962, with astronaut John Glenn aboard, weighed 2,900 pounds. The Space Shuttle Orbiter, the Enterprise, to be launched some time in 1981, weighs 150,000 pounds empty, has room for up to seven crewmen and a cargo bay capable of handling payloads of up to 65,000 pounds (NASA News Release No. 77-21 (Feb. 9, 1977)). One of the largest Soviet launch vehicles, the Proton class, can lift about 40,000 pounds into earth orbit. *Aviation Week & Space Technology* [hereinafter cited as AWST], in its annual survey for 1978 of U.S. and foreign rockets listed, without supporting evidence, a Soviet launch vehicle capable of placing into orbit a payload of 350,000 pounds (AWST (March 12, 1979), 94-5).

[50] Cook, *The Warfare State* (1962), 347.

[51] See *Arms Control and Disarmament Agreements, supra,* note 10, 47.

[52] Ulsamer, *Will the Soviets Wage War in Space?* Air Force Mag. (Dec., 1976), 30, 35, quoting a Library of Congress study.

take place, they were not in violation of the letter of the *Outer Space Treaty* because the FOBS satellites, as the Americans readily admitted, were not armed with weapons of mass destruction, and were programmed to return to earth before completing a full orbit.[53] While the FOBS tests are reported to have ended in 1971, a Library of Congress study asserts that there is no evidence to suggest that the U.S.S.R. has abandoned the program or to refute the assumption that FOBS weapons are fully operational and waiting in their silos, mixed with regular ICBM's.[54] Although at this time the concept of bombardment from orbit appears inactive, it may yet be revived. This could occur either through deliberate change of national policy or in response to a destabilizing advance in military space technology by the adversary. One should bear in mind that today both the U.S. and the U.S.S.R. possess sufficiently powerful rockets to lift even the heaviest nuclear weapons into orbit.[55] Each could do so, legally, by giving the required one year's notice of withdrawal from the *Outer Space Treaty* (article XVI), or by ignoring the Treaty in the hope that its violation would go undetected. Neither this nor any other space or arms-control agreement provides for inspection of satellites on the ground or in orbit; only "stations, installations, equipment and space vehicles" located

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[53] *Outer Space Treaty*, art. IV.

[54] Ulsamer, *supra*, note 52, 35. See also *Soviet Space Programs*, *supra*, note 30, 491-2.

[55] See note 49, *supra*. In a rampant arms race no weapons concept is too irrational, or too grotesque, for the military planners, not even "bombs in orbit". To make its "Minuteman 2" intercontinental land-based ballistic missile force "survivable", the U.S. Defence Department is reported to be studying the feasibility of placing a large number of these nuclear-armed missiles into a "parking orbit" around the earth. The missiles would be launched on warning of an impending attack and would remain in low orbit (125 to 800 miles) until signalled to attack targets in the Soviet Union. Should their services not be required, say, because there had been no Soviet attack but merely a malfunctioning warning system, they would be recalled and recovered. The estimated cost of the new system is trifling by current standards (less than $20 billion) and it could be ready for deployment in the 1980's. The planners admit that recovery of nuclear warheads, following an aborted orbital launch, would be "a lengthy process" and that flying armed missiles over the U.S. might cause political difficulties. However, they feel that this orbital system would not violate either the SALT II treaty or the *Outer Space Treaty*, since the weapons would be placed into space only in the event of an attack on the United States (AWST (Feb. 25, 1980), 16; AWST (March 3, 1980), 27). On the potential for unintended disaster, due to technical or human errors, of such weapons systems, see Dumas, *Human Fallibility and Weapons* 36 Bull. Atom. Scientists (Nov., 1980), 15. See also note 104, *infra*.

on the moon and other celestial bodies are subject to verification (*Outer Space Treaty,* article XII).

However, the most immediate threat, both to stability in outer space as well as to the maintenance of peace on earth is not the nuclear-weapon satellite; it is posed by recent trends and innovations in military space technology involving risks which should be of profound concern to the entire international community. Evidence of rapid militarization of outer space is mounting and it is most unlikely that this new environment will much longer remain a "sanctuary" for non-aggressive activities, unless governments can be persuaded to take swift and effective counter-measures.[56] The more destabilizing examples of new military space technology, already in the process of advanced planning, development or deployment, include certain types of surveillance satellites, satellites for guidance of strategic missiles, anti-satellite space systems and directed-energy weapons.

A. *Ocean surveillance satellites*

The most common military satellites, and the first to achieve operational status, are those used for observation. From relatively simple photo-reconnaissance of ground-based installations, they have been developed into highly sophisticated, multi-ton instruments capable of monitoring not only the physical environment below but also radio signals emitted from any source on the globe.[57]

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[56] The prospect of things to come was rather ominously (and accurately) predicted in mid-1975 by Dr Malcolm R. Currie, the Pentagon's chief of research and development. In his view, "over the next ten or fifteen years space is not going to remain the unmolested territory, the sanctuary that it is today" (Air Force Mag. (June, 1975), 28). Five years later, quoting "senior Defense Department officials", a leading U.S. aerospace periodical was able to assert that "[b]ecause of the move into space by the two superpowers, space is becoming the most likely battlefield" and that "any nuclear weapons exchange with the USSR will start in space" (AWST (March 3, 1980), 25). The trend is clear "as more and more combat-related functions such as target designation, weapons guidance, and real-time reconnaissance of ground, sea, and air forces move into space and as technology provides better means to jam, blind, or destroy an adversary's spacecraft selectively or even surreptitiously" (Ulsamer, *supra,* note 52, 30: see also AWST (July 28, 1980), 32).

[57] By all accounts, the most advanced reconnaissance satellite in use today is the U.S. "Big Bird", weighing 12 tons and operating in orbits ranging from 90 to 250 miles. Reportedly, it is able to detect from an altitude of 100 miles objects on the ground roughly the size of a tennis ball (U.S. News & World Report (May 21, 1979), 25; Time (Feb. 6, 1978), 8). It is believed that the Soviet Union employs some of its Cosmos satellites, a designation borne

Deployed by both space powers for a number of years, observation spacecraft are regarded today as indispensable tools for the collection of intelligence and verification in the context of SALT agreements.[58] However, when the exclusive or principal purpose of a satellite system is to monitor radio communications and radar emissions from an adversary's submarines and surface warships, so that they can be quickly and accurately located, attacked and destroyed on command, one is no longer dealing with relatively innocuous supporting instruments like the earlier communications and photo-reconnaissance space vehicles. Unrelated to offensive strategic weapons systems, an observational satellite network could be justified as contributing to the aims of SALT, national and international security. But such, apparently, are not the objectives of the new U.S. "ocean surveillance" satellite system; its reported function clearly poses a serious threat to an essential segment of the Soviet strategic deterrent force, that is, their nuclear ballistic submarines.[59] Since the ability of these submarines to remain undetected is the key factor of their deterrent value, the deployment by the United States of this new satellite network may be regarded on the Soviet side as providing their adversary with the dreaded "first strike" capability. Should the U.S.S.R. reach that conclusion,[60]

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by over 1,200 spacecraft, as well as the Salyut space station, for purposes of military reconnaissance. However, very few details about the capability of these spacecraft are known. See, *e.g., Soviet Space Programs, supra,* note 30, 390 *et seq.;* AWST (Dec. 4, 1978), 17.

[58] Satellites possibly represent the essential component of the so-called "national technical means of verification", referred to in art. XII of the U.S. — U.S.S.R. *Treaty on the Limitation of Anti-Ballistic Missile Systems* (1972): for text see *Arms Control and Disarmament Agreements, supra,* note 10. In President Carter's words, "[p]hoto-reconnaissance satellites have become an important stabilizing factor in world affairs. In the monitoring of arms-control agreements, they make an immense contribution to the security of all nations" (quoted in U.S. News & World Report (May 21, 1979), 25).

[59] AWST (July 10, 1978), 22. See also Aldridge, *Nuclear First Strike? The Pentagon is Working on it* The Nation (June 11, 1977), 711. The "National Oceanic Satellite System", a joint endeavour of NASA, the National Oceanic and Atmospheric Administration and the Defence Department, belongs to the same category of spacecraft, despite its various civilian uses. To be initiated in the 1981 fiscal year, at an estimated cost of $800 million, this system is expected to assist the U.S. Navy, *inter alia,* in the selection of operating areas, in anti-submarine warfare and acoustic predictions (NASA News Release No. 80-7 (Jan. 28, 1980)).

[60] If Marshal D. Ustinov, the Soviet Defence Minister, is to be taken seriously, his government does believe that the United States armed forces "are being developed in ... accordance with the military doctrine that includes preventive strikes at the probable adversary" (Ustinov, *Military*

its likely response would be to deploy in outer space an effective defensive weapon such as a satellite interceptor, or some other means of neutralizing the threat.[61] In anticipation of such a move, the United States will presumably feel justified in installing its own instruments of satellite protection, thus providing new impetus to the spiralling arms competition in outer space.[62] Indeed, the decision of the American defence establishment to accelerate the development of a U.S. anti-satellite (ASAT) capability may well reflect as much their anxiety about the expected Soviet response as about the suspected Soviet possession of ASAT weapons.

B. *Satellites for guidance of strategic missiles*

A related technological innovation, designated the "NavStar global positioning system", is already being deployed by the United States and is expected to be fully operational in 1985. The purpose of the NavStar system is to provide, through a network of satellites, extremely accurate guidance for nuclear-armed missiles which, once fired, will be able to update their navigation instruments during the coasting phase of flight. In its original conception the system, when fully operational, would consist of twenty-four satellites orbiting the earth in three clusters of eight,[63] with satellites positioned in such a way that any location on the earth's surface would have several vehicles in sight at all times. Every few thousandths of a second, the satellites will broadcast coded signals that can be received by computers aboard missiles. With information supplied by

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Detente — Imperative of the Time Int'l Affairs [Moscow] (Jan. 1980), 3, 4); See also a commentary on Presidential Directive 59 by G.A. Trofimenko, published in N.Y. Times (Sept. 22, 1980), A-27, col. 3.

[61] Scoville and Tsipis observe that the progressive "integration of [U.S.] space-borne systems into combat operations may have reawakened Soviet interest in anti-satellite systems, which, if operational, could threaten the unimpeded functioning of some U.S. space assets during wartime" (*supra*, note 46, 9).

[62] In reporting the launching on April 29, 1980 of a Soviet radar ocean surveillance spacecraft, similar to Cosmos-954 which disintegrated over northern Canada in 1978, AWST noted that this type of satellite "creates strategic-military concerns because of [its] ability to find and target U.S. ships": owing to these concerns, this spacecraft is "high on the target lists for U.S. anti-satellite weapons" (AWST (May 5, 1980), 25). The report, however, does not attribute to the Soviet satellite the capability to detect submarines. See also N.Y. Times (May 2, 1980), A-3, col. 1.

[63] AWST (Oct. 17, 1977), 77; AWST (Aug. 27, 1979), 51. As of April, 1980, six NavStar satellites had been launched in orbits of 10,900 nautical miles (AWST (May 5, 1980), 27). Due to budgetary restrictions, the number of satellites in the NavStar constellation may be reduced to 18 (AWST (April 14, 1980), 20).

NavStars, the missile's computer is expected to guide the projectile to the target with pin-point accuracy, that is, within an estimated margin of error of five meters in each horizontal direction.[64] To assure the uninterrupted functioning of the system, transmitters aboard NavStar satellites are designed to emit signals which are difficult to jam and able to penetrate any weather.

A parallel effort may be under way in the Soviet Union. Some time ago, the U.S. Secretary of the Navy asserted that the U.S.S.R. was also using satellites for real-time mid-course guidance of ballistic missiles,[65] although a Library of Congress study, a more reliable source, found no corroborating evidence.[66]

It is worth noting that by the accepted standards of nuclear deterrence, the pin-point accuracy promised by the NavStar network is not necessary to maintain the existing balance of terror. Indeed, the concept of "mutual assured destruction" is based on the premise that war between the Soviet Union and the United States can best be deterred if each nation has the capability of inflicting intolerable losses on the population and social fabric of the other in the event of a nuclear exchange.[67] Acceptance of the concept of mutual vulnerability is also the cornerstone of the *ABM Treaty*, concluded in 1972 between the two super-powers.[68] In the words of Ambassador Gerard Smith, who led the American SALT I negotiating team, the *ABM Treaty* represents a "recognition that the deterrent forces of both sides are not going to be challenged".[69] Thus, by making it possible to destroy, or cripple seriously, the adversary's strategic missile force before it has been released, the new space technology

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[64] AWST (Oct. 17, 1977), 159. See also Tsipis, *Cruise Missiles, supra,* note 29, 23. Initial tests of NavStars have resulted in accuracy within 6-7 meters (AWST (Nov. 27, 1978), 60).

[65] J. William Middendorf, as quoted by Ulsamer, *supra,* note 52, 33; see also AWST (Oct. 4, 1976), 13.

[66] *Ibid.* The recent survey of Soviet space activities by Charles S. Sheldon II makes no reference to a Soviet NavStar system (*The Soviet Space Program in 1979* Air Force Mag. (March, 1980), 88). Conceivably, unknown to Western observers, the U.S.S.R. may be working on a comparable satellite network.

[67] The essence of nuclear deterrence or "mutual assured destruction" (MAD) can be stated very simply: neither side can launch a nuclear attack against the other without risking nuclear devastation of its own society in return.

[68] *ABM Treaty*: for text see *Arms Control and Disarmament Agreements, supra,* note 10.

[69] Quoted in Larocque, *Security Through Mutual Vulnerability* (Stanley Foundation Occasional Paper No. 2, 1973), 6. There can be no mutual restraint or deterrence on the use of strategic nuclear weapons if one side acquires the ability to destroy the other without fearing the like destruction.

has the potential for arming one nation with pre-emptive, first-strike capability. This situation cannot but undermine decisively the foundations of the existing philosophy of deterrence. The true goal of the NavStar system, at least in the opinion of some analysts, is the "devastating ability to launch an all-out nuclear attack which could completely disarm an opponent".[70]

The magnitude of the threat posed by these and related developments,[70a] both to the strategic equilibrium between the two major power blocs and the cause of peace in outer space, cannot be exaggerated. The very real potential for conflict, initially perhaps limited to outer space, was unmistakably revealed several years ago by J. William Middendorf, when he was Secretary of the U.S. Navy. Voicing a suspicion that the U.S.S.R. might be developing a system similar to the NavStar, he called for accelerated efforts on the part of the United States to produce instruments which could "neutralize" such Soviet spacecraft "through the use of chaff [to "blind" them] or by interdiction [*i.e.*, destruction]".[71] It is, therefore, obvious that, even in non-combat conditions, the temptation will be great to interfere with space vehicles regarded as strategic threats, and so will the prospects of uncontrollable escalation.

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[70] Aldridge, *From MARV to Holocaust* The Nation (March 26, 1977), 360, 361. The author is an aerospace engineer who worked for sixteen years on the Polaris, Poseidon and Trident submarine-launched nuclear missiles. See also, Stockholm International Peace Research Institute, *World Armaments and Disarmament Yearbook* (1979), 449.

[70a] When viewed in conjunction with Presidential Directive 59 (*supra*, note 29) and the commitment to build a new land-based, supposedly "invulnerable", mobile missile system (the so-called MX system), the intentions of the United States cannot but arouse grave suspicion in the Soviet Union. According to Professor Bernard T. Feld of M.I.T., the new "countervailing" strategy means that the U.S. intends to use its nuclear weapons "in an entirely offensive mode in an attempt to destroy the Soviet nuclear forces before they can be used against us" (36 Bull. Atom. Scientists (Oct., 1980), 5). John B. Oakes, former Senior Editor of The N.Y. Times, commenting on the effect of the MX-missile system observes: "What the MX in fact does is to increase our own 'first-strike' capability, feeding the Russian suspicions that we could indeed be planning a first strike, just as we suspect they might be, despite the utter insanity of such an act on both sides" (N.Y. Times (Oct. 21, 1980), A-19, col. 1).

[71] As quoted in Ulsamer, *supra*, note 52, 33. More recently, Seymour L. Zeiberg, Deputy Under-Secretary of Defence, asserted that the "principal motivation for [the U.S.] antisatellite program is to put us in a position to negate Soviet satellites that control Soviet weapons systems that could attack our fleet" (AWST (Sept. 3, 1979), 57).

C. *Anti-satellite space systems*

Probably in anticipation of an expanding arms race in outer space, the Soviet Union in the late 1960's reportedly commenced experiments with an anti-satellite (ASAT) weapons system variously designated in the West as "killer satellites", "hunter-killer satellites", "satellite interceptors" or "inspector-destroyer satellites". While the Soviets have never publicly admitted to such uses of space technology, American sources, including the highest government officials, claim that the U.S.S.R. conducted sixteen separate ASAT tests between October, 1968 and April, 1980.[72] Ten of the tests have been judged by American defence analysts as "possible successes". It was reported that in each of these "the killer spacecraft passed within 1 km. (3,180 ft) of its intended target [,] indicating that the mission could have been a success, although flyby distance alone does not guarantee success".[73] No authoritative U.S. spokesman has so far asserted, however, that these satellites have either interfered with American spacecraft or destroyed a Soviet target spacecraft.[74] Furthermore, detected Soviet ASAT tests are known in all instances to have involved flights at altitudes of less than 2,000 kilometers, well below the geosynchronous and high elliptical orbits from which many of the key U.S. military satellites (such as communications, command control and early warning satellites) operate.[75] On the other hand, low-altitude American reconnaissance and navigation satellites, as well as the space shuttle, would appear to be within the range of the Soviet ASAT system.

Reports of the Soviet anti-satellite experiments have resulted in predictable demands by the American defence establishment for a major national effort to counter the suspected Soviet threat.[76] Shortly before leaving office in 1977, President Ford ordered the urgent development of an American anti-satellite weapon; after some hesitation and further study, President Carter's administration

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[72] AWST (Oct. 30, 1978), 17. After a two-year moratorium, according to U.S. sources, the Soviets carried out another anti-satellite test on April 18, 1980 (N.Y. Times (April 19, 1980), B-28, col. 1).

[73] AWST, *ibid.*

[74] The suspected Soviet test of April 18, 1980 has been assessed by the U.S. intelligence as a failure because the interceptor exploded 8 km. from the target spacecraft (AWST (April 28, 1980), 20; N.Y. Times, *supra*, note 72).

[75] AWST (Oct. 30, 1978), 17; Sheldon, *supra*, note 66, 92.

[76] Anti-satellite research is not new to the U.S. defence planners. Already in 1966 an American author reported that the U.S. Air Force "is busily acquiring design data from the Gemini flights that will enable it to build combat spacecraft if the need arises" (Carroll, *supra*, note 45, 195-6).

affirmed the Ford decision in the spring of 1979.[77] The new policy directive provided for laboratory research, development and actual testing against space targets. Whether such tests will be held was left by Mr Carter as contingent upon successful negotiations with the U.S.S.R. on the ban of offensive weapons in space.[78] Given a free hand, in a remarkably short period of time, the Pentagon succeeded in developing its own ASAT weapon, expected to be ready for tests against targets in space by 1982.[79] In contrast to the Soviet system, reported effective only in low orbits, the U.S. interceptor will be able to attack hostile satellites both in low orbits as well as in synchronous orbits.[80]

At the initiative of the United States, informal talks with the Soviet Union aimed at the "control and elimination of anti-satellite capabilities" began in June, 1978 in Helsinki. Additional negotiations were held in February, 1979 (Bern) and again in May and June, 1979 (Vienna), all with inconclusive results.[81] The latest round of negotiations may in fact have set the two sides further apart than they were at the beginning of the talks. The reason given by U.S. officials is Soviet insistence that American space shuttle development be halted, because it is seen as a threat to the U.S.S.R. satellites. Predictably, the U.S. negotiators found the Soviet position "totally unacceptable".[82] Since the space shuttle has become a major issue in these negotiations, this project of fourteen billion dollars justifies closer examination.

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[77] *United States Space Activities* (1978) 14 Weekly Compilation of Presidential Documents (June 26, 1978), 1135, 1137; *The New Military Race in Space* Business Week (June 4, 1979), 136, 145.

[78] *Ibid.*

[79] N.Y. Times (April 19, 1980), B-28, col. 1.

[80] See AWST (Aug. 13, 1979), 13. In a significant departure from the Soviet system, the U.S. anti-satellite weapon will be fired from a high-flying aircraft (F-15) (AWST (June 25, 1979), 23). U.S. Air Force plans to procure 15 ASAT weapons and 10 target spacecraft in fiscal year 1981 for the initial tests (AWST (Nov. 26, 1979), 13). In addition to this, the U.S. is evaluating two more advanced ASAT systems, one based on lasers and the other on conventional spacecraft technology (AWST (July 17, 1978), 14). A group of U.S. experts, discussing "US-USSR Confrontation or Cooperation in Space", found that the "threat of ground-based ASAT weapons is presently more serious than the threat of space-based systems" (*Nineteenth Strategy for Peace Conference Report, October 5-8, 1978* (The Stanley Foundation, 1978), 22).

[81] See AWST (July 9, 1979), 18; U.S. Arms Control and Disarmament Agency, *Arms Control 1978* (1979), 36-7; N.Y. Times (June 1, 1979), A-6, col. 1. No new negotiations have been scheduled.

[82] AWST, *ibid.*

D. *U.S. space shuttle*

Officially designated as the "reusable space transportation system", the shuttle is a joint programme of NASA and the Pentagon. Its first flight into outer space is expected to take place in 1981. The publicity which has accompanied this technological marvel practically from its inception has invariably stressed its great utility in a wide variety of civilian space functions.[83] Rarely mentioned is the active role of the military in the planning, development and financing of the shuttle, as well as its origins in the Pentagon's "Manned Orbiting Laboratory", an exclusive defence project that was cancelled in 1969 for lack of funds.[84] Equally ignored is the fact that a significant percentage of the shuttle's payload capacity has been reserved for military missions.[84a]

The declared purpose of the shuttle is to lift and position in outer space new satellites and, when necessary, retrieve or repair in orbit malfunctioning and "spent" satellites, all at a much lower cost than is possible with existing technology. Large enough to carry up to seven astronauts and highly mobile, the shuttle also has the capability to refuel spacecraft already in space, rotate crews on long-range missions and conduct observations of the earth in its landing phase. The military potential of the shuttle, with its offensive and defensive versatility, is considerable. The craft is expected to perform more diverse tasks and much more efficiently than the Soviet ASAT weapon. It will not only be able to destroy hostile satellites (reportedly the sole function of the Soviet system) but also to inspect, incapacitate and even "steal" objectionable

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[83] See, *e.g., International Implications of New Space Transportation Systems*, a report prepared by the International Astronautical Federation for COPUOS, U.N. Doc. A/AC. 105/244 (Aug. 16, 1979); NASA News Release No. 77-181 (Sept. 7, 1977). Legal implications of the space shuttle are extensively discussed in Sloup, *A Guide for Space Lawyers to Understanding the NASA Space Shuttle and the ESA Spacelab* (1977) 26 Zeitschrift für Luft — und Weltraumrecht 196.

[84] The relatively short, but expensive ($1.3 billion), life of MOL and its temporary demise are discussed in Vlasic, "The Relevance of International Law to Emerging Trends in the Law of Outer Space" in Falk & Black, *The Future of the International Legal Order* (1970), Vol. 2, 265, 285-7. Not long after the advent of the space age, according to an eminent U.S. defence analyst, the Pentagon was intensively studying the possibilities of using spacecraft for purposes of inspecting, capturing and destroying hostile and unknown satellites (Brennan, *supra*, note 48, 134). The U.S. Air Force, NASA's partner in the space shuttle, participated in the design of this instrumentality, seeing it as a potential "reconnaissance vehicle or satellite interceptor" (Time (June 22, 1970), 41).

[84a] 30% according to a recent report (AWST (Oct. 6, 1980), 19).

space vehicles.[85] Furthermore, the shuttle is viewed as the likely carrier of heavy payloads required for assembling in orbit future beam-weapon "battle stations".[86]

Even when performing civilian assignments, the shuttle's activities could raise suspicion on the part of other nations with satellites in orbit. As two well-informed American authors warn, "many of the operations of the U.S. space shuttle have many similar technical requirements and overt characteristics as has an anti-satellite mission and therefore could be confused with a program to develop an anti-satellite capability".[87] The risks inherent in even an innocuous inspection by one nation of another nation's spacecraft in outer space have been persuasively stated in an authoritative survey:

> Inspection seems harmless enough, but the problem is that if satellites conducting military functions co-orbit with uncooperative targets of investigation, the added capability of destruction is a very simple step compared with the rendez-vous and the selection of sensors capable of doing a good inspection. Any space power must worry about the possibility that another space power may escalate rivalries to the point of interference with satellites in orbit, whether it is to blind the eyes of some, to deafen their ears, or disrupt communications, or take away some abilities to navigate. This means that such nations must consider a range of both passive and active counter-measures ... .[88]

The possibility of hostile action in outer space led the U.S. Air Force in 1974 to initiate studies of measures to enhance the survivability of its satellites. One measure already implemented involves stationing important military satellites in a dormant, unpowered state at extremely high altitudes where they evade the adversary's ground-based detection systems. These "dark satellites" would be activated if the enemy should succeed in neutralizing the early warning, command control and communications spacecraft known to it.[89] In a parallel development, the Pentagon ordered the

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[85] Scoville & Tsipis, *supra*, note 46, 16; AWST (April 17, 1978), 17; *Space Shuttle: High-Flying Yankee Ingenuity* Air Force Mag. (Sept., 1976), 98, 104; Time (July 16, 1979), 20.

[86] AWST (Oct. 16, 1978), 42, 43, 48; AWST (Oct. 23, 1978), 15. Even before the first launch of the shuttle, the U.S. Defence Dep't is already reported to be planning a "manned military combat spacecraft" for use in year 2000. This vehicle would incorporate characteristics of aircraft and spacecraft (AWST (March 31, 1980), 57). The development of an "aerospace plane", under the exclusive control of the military, is said to be the ultimate goal of the Pentagon (Ulsamer, *Space Shuttle Mixed in Bureaucratic Feud* Air Force Mag. (Sept., 1980), 72, 77).

[87] Scoville & Tsipis, *supra*, note 46, 16.

[88] A Library of Congress study, *supra*, note 52, 33.

[89] *Ibid.*, 30.

production of a "nightwatch" network of earth-based telescopes and television cameras to detect and track satellites orbiting thousands of miles in space. The network, which is expected to become operational in the early 1980's, should give warning of an imminent attack against any American spacecraft in orbit.[90] Steps are also being taken to harden key defence satellites so as to make them less vulnerable to hostile interference. Other protective methods under examination or in the process of implementation involve "deception, including reducing satellite radar and optical siguature or disguising a military spacecraft as a scientific space telescope."[91] How many of these ideas have been implemented is not known. However, the apparent willingness of U.S. defence planners to compromise the civilian space programme and risk having NASA's scientific satellites mistaken for military vehicles by other countries, underscores the danger of uncontrolled militarization of outer space for all nations. The trend also highlights the growing, often clandestine, subversion of the spirit and the letter of the *Outer Space Treaty*.

The nearest system comparable to the shuttle in the existing Soviet arsenal is the Soyuz-Salyut-Progress "orbital complex".[92] Although officially described as a scientific and engineering programme, there should be no doubt that it also performs various military missions. This system is not, however, as manoeuverable as the shuttle, and is not capable of retrieving large objects such as satellites and returning them to earth. The misadventures of Cosmos-954, a nuclear-powered spacecraft, suggest that the U.S.S.R. still lacks the ability to recover from or destroy in outer space even its own instrumentalities. Western sources occasionally report, without supporting evidence, that the Soviets "may" be testing their version of the shuttle, which could become operational in the 1980's.[93] While there has been no independent confirmation of

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[90] N.Y. Times (May 17, 1978), A-18, col. 3.

[91] AWST (Feb. 4, 1974), 11. A more recent report quotes a U.S. Defence Dep't official as saying that there is "a frantic effort [in progress] to harden, shield and hide our satellites" (AWST (March 3, 1980), 25).

[92] See, *e.g.*, *Soviet Success in Space Exploration*, Int'l Affairs [Moscow] (May, 1978), 132, 135; Sheldon, *supra*, note 30, 90 *et seq.*; AWST (Dec. 4, 1978), 17.

[93] *E.g.*, Sheldon, *supra*, note 30. A leading French aerospace periodical, citing unidentified Soviet sources, reported in 1979 that the U.S.S.R. plans to build a "mini-shuttle" (Air & Cosmos (Sept. 15, 1979), 38). But see Air & Cosmos (Sept. 20, 1980), 43. U.S. Secretary of Defence, Harold Brown, seeking from Congress bigger appropriations for the American space shuttle, also asserted that the United States "had evidence that the Soviet Union might be

these reports, one can think of no technological or engineering obstacles to prevent the U.S.S.R. from developing a shuttle-like vehicle, should its "national interests" so dictate. The prospect of having its satellites subject to interception, inspection and possibly interference by the adversary might be regarded as sufficient reason to embark upon such a course of action.

The immediate consequences of these developments could be serious. Especially in the absence of an international agreement regulating satellite inspection in outer space, even the harmless unauthorized interception of another country's spacecraft could lead to conflict. And when the two nations do decide to negotiate in good faith, the nature of both the inspecting vehicle and of space interception is bound to make it "extremely difficult to include in a treaty language that could reliably differentiate legitimate non-warlike activities from proscribed operations."[94]

E. *Directed-energy weapons*

Recent advances in the development of so-called directed-energy weapons represent potentially the most serious threat, not only to public order in outer space but to the cause of peace in general. Published reports appear to leave no doubt that a Soviet-American competition to harness directed-energy technology for military purposes is well under way.[95] Experiments so far have involved two basic types of technology, one using high-energy laser beams, and the other employing a beam of atomic particles (electrons, protons and neutrons). With either technology, the destruction of the target would be achieved partly by intense heat, and partly by the explosion that such sudden heating produces. Of the two, the techno-

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developing a re-usable space vehicle", although, he noted that the Soviets were at least a decade behind in this field (N.Y. Times (Feb. 8, 1980), A-14, col. 4). "The Soviets appear to confine their efforts to the development of a relatively unsophisticated reusable manned space transportation system that could start flight testing within two or three years" (Ulsamer, *supra*, note 86, 77). A similar conclusion is reached by Oberg, *Is There a Soviet Space Shuttle?* Space World (Aug.-Sept., 1980), 21.

[94] Scoville & Tsipis, *supra*, note 46, 16.

[95] See a series of three articles by Robinson in AWST (Oct. 2, 1978), 2; (Oct. 9, 1978), 42; (Oct. 16, 1978), 42. See also AWST (Nov. 13, 1978), 14; AWST (July 28, 1980), 32; Smernoff, *Strategic and Arms Control Implications of Laser Weapons: A Preliminary Assessment* Air U. Rev. (Jan.-Feb., 1978), 38; N.Y. Times (Dec. 4, 1978), 1, col. 6; N.Y. Times (Nov. 25, 1979), 37, col. 1; N.Y. Times (March 3, 1980), A-16, col. 1; Mason, *Particle-beam Weapons: a controversy* Spectrum (June, 1979), 30; Aldridge, *Missile Killers: The Hidden Arms Race* The Nation (Oct. 18, 1980), 368.

logy of laser weapons is far more advanced, particularly in the United States. By 1979 the Pentagon spent 1.3 billion dollars on its development and "has already scored impressive kills in tests of a laser's ability to bring down missiles in flight."[96] However, some doubts persist about the effectiveness of lasers when used in the atmosphere where their destructive potential can be significantly reduced by heavy clouds and stormy weather. Because its propagation requirements are quite different, a particle-beam weapon does not suffer from this weakness. By propelling atomic particles at velocities approaching the speed of light, particle-beam weapons are believed to be capable of destroying targets, through energy concentration and thermal effects, in the atmosphere and in outer space. The vacuum of outer space is regarded as the optimal environment for the use of beam weapons against satellites, which are notoriously fragile and therefore extremely vulnerable.

Some segments of the U.S. defence community hope that both the laser and particle beam devices can eventually be developed into effective weapons against strategic ballistic missiles; enemy missiles would be attacked and destroyed by these weapons during their boost phase, shortly after firing. A study prepared by the Los Alamos Scientific Laboratory asserts that

> Laser and particle-beam weapons hold the potential for an extraordinarily effective defense of all national assets against both ICBM and SLBM attack but are in a very early state of development ... . These systems would be triggered by satellite detection on launch of U.S.S.R. missiles and would reach out thousands of miles with pinpoint aiming and tracking to destroy Soviet missiles in powered flight or reentry vehicles in mid-course.[96a]

It is no wonder that the proponents of directed-energy technology see it as the "ultimate" weapon, giving the first country to master it an overwhelming superiority in the global strategic contest. The editor of an influential American aerospace magazine predicted that "[i]f the Soviets achieve this capability first, it will give them enormous crucial leverage in imposing their political will on the rest of the world."[97] On the other hand, if the United States wins the race, "there will be no need for flimsy SALT agreements, and the threat of Soviet nuclear blackmail will lose its credibility."[98]

Evidence of the Soviet efforts in beam-weapons technology is still fragmentary and the available information is based largely on the well-known Soviet experiments with electron-beam accelerators

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[96] Business Week, *supra*, note 77, 142; AWST (April 2, 1979), 12.
[96a] AWST (July 28, 1980), 32, 34.
[97] Robert Hotz, AWST (Oct. 2, 1978), 9.
[98] *Ibid.*

and high-energy lasers. Although some analysts believe that these experiments could "eventually be used as the basis for a proton beam weapon device",[99] an evaluation by a scientific committee of the U.S. Air Force, released late in 1978, found no tangible proof that the U.S.S.R. was working on a beam-weapons system.[100] However, a subsequent and "more intense" examination by another panel appointed by the Pentagon reported "a massive Soviet development program aimed at producing charged particle beam weapons", and recommended an acceleration in American research and development in this area.[101] Whether this finding is accurate or not, the Soviet Union's scientific and engineering capabilities almost certainly enable it to pursue a major effort towards developing these exotic devices, having discovered that its principal rival has already done so,[102] for it is in the nature of the modern arms race that one side will never permit itself to fall dangerously behind the other in the acquisition of weapons which may alter the strategic equilibrium.

If claims about the capability of directed-energy weapons to intercept nuclear delivery systems are based on fact, and evidence to that effect is accumulating, the repercussions for world peace could be incalculable. The prospect of a successful pre-emptive strike associated with directed-energy devices is so ominous that even the slightest evidence of assymetry between the two superpowers in the development of this weapon could not fail to produce a dramatic political and military reaction. The risks of misjudgment are great. As an American expert notes, it will be hard to differentiate between future directed-energy systems "designed to track and image satellites and those having marginal capabilities for delivering lethal bolts of laser energy to relatively fragile satellites or eventually to strategic nuclear aircraft and missiles."[103] Similar problems exist in distinguishing between the employment of particle-beam technology for weapons purposes and its civilian use in the development of hydrogen fusion as a new source of energy.

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[99] AWST (Nov. 13, 1978), 14.

[100] *Ibid.*, 20; N.Y. Times (Dec. 4, 1978), D-11, col. 5.

[101] AWST (May 7, 1979), 7. See also AWST (July 28, 1980), 47. For a contrary view, see Garwin, *Charged-particle Beam Weapons?* 34 Bull. Atom. Scientists (Oct., 1978), 24.

[102] A Russian military commentator, without mentioning Soviet work in this field, complained in a recent article about a "mounting effort" on the part of the U.S. "to develop radiation weapons using the energy of lasers and elementary particles" (Below, *NATO Arms Buildup After 30 Years* (1979) 16 Co-existence 142, 143).

[103] Smernoff, *supra*, note 95, 47-9.

There can be no doubt that directed-energy weapons in outer space, whether designed merely to attack other spacecraft or programmed to neutralize ballistic missiles, would have a profoundly destabilizing effect. With their introduction into the armouries of the super-powers, the possibility of space confrontation and space warfare, either by design or through accident,[104] would

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[104] In the 1950's and 1960's, when the nature of armaments and the scope of the arms race were simpler than they are today, the hazards of an accidental nuclear war were a major preoccupation of the government officials and military analysts. For some reason, this problem no longer attracts much official or public attention. It seems that "Murphy's Law" ("if anything can go wrong, it will") has been exorcised from application to modern weapons systems. There is no dearth of evidence to show that ultra-modern technology, and people operating it, on occasion do not perform according to expectations. Military aircraft are known to have lost nuclear bombs (*e.g.*, Spain, 1966); the "impossible" chain of events almost destroyed a nuclear power-plant at Three Mile Island; a DC-10 airliner, which was supposed to fly on two engines, crashed at Chicago having lost only one of its three engines; two large advanced spacecraft, the Soviet Cosmos-954 and the U.S. Skylab, became uncontrollable and fell to the earth, whereas a $50 million RCA communications satellite shortly after its launching in 1980, mysteriously disappeared somewhere in outer space. And three times within seven months (Nov., 1979, and twice in June, 1980) a computer in the North American Air Defence Command (NORAD) malfunctioned and signalled a Soviet missile attack on the United States (N.Y. Times (Dec. 16, 1979), 25, col. 1; N.Y. Times (June 6, 1980), A-14, col. 1; N.Y. Times (June 9, 1980), D-15, col. 3). According to a recent congressional report, in the 18 months that ended June 30, 1980, NORAD experienced "147 false alarms that were serious enough to require an evaluation of whether they represented a potential attack" (N.Y. Times (Oct. 29, 1980), A-16, col. 1).

Similarly, although equipped with the most modern technology and operated by the best trained crews, nuclear submarines, the principal instrument of deterrence, are immune neither to equipment breakdowns nor to human error. Since their initial deployment by the major navies, in the late 1950's, there have occurred four known major disasters and possibly many more that have gone unreported. The United States has lost two nuclear-powered submarines due to undetermined causes, the *U.S.S. Tresher* in 1963 and the *U.S.S. Scorpion* in 1968. The Soviet navy has a comparable record of misfortune. One of its nuclear submarines sunk in the Pacific in the 1960's, prompting the C.I.A. to embark upon its well-publicized and apparently unsucessful attempt to raise her; and another one was lost in the Atlantic in 1970. See Middleton, *Submarine* (1976), 175, 186; U.S. Dep't of the Navy, *Understanding Soviet Naval Developments*, 3d ed. (1978), 77.

Even assuming that every imaginable precaution has been taken to prevent these submarines from inadvertently causing global conflagration, the risks have by no means been totally eliminated. As Drew Middleton, military analyst of The New York Times, reports, "Navy departments the world over are concerned" with the human factor since even a single "undetected psychotic [among the crew of a nuclear submarine] could start the holocaust"

increase markedly and could escalate into an all-out nuclear conflict. The authoritative *Arms Control Impact Statement* for 1978, prepared by the U.S. Arms Control and Disarmament Agency, warned that future "space wars" between the United States and the U.S.S.R., waged with lasers and particle-beam weapons, are not inconceivable if present trends continue.[105] It seems clear, therefore, that any further development of these devices, at the very least, is bound to aggravate the monumental difficulties in arms-control negotiations, may render existing strategic-arms limitation agreements meaningless, and will inevitably raise international fear and distrust to unprecedented heights. Fortunately, there is still time to arrest this dangerous trend, for neither super-power is near even a prototype weapon yet.

III. Military uses of outer space and international law

A. *The obligations of states under the Outer Space Treaty*

Before the entry into force of the *Outer Space Treaty,* there were no explicit restrictions on the military uses of space in international law. The only legal restrictions were those in the *Limited Nuclear Test Ban Treaty* of August 5, 1963, by which the United States, the Soviet Union and the United Kingdom agreed to prohibit, to prevent and not to conduct any test of nuclear weapons, or any

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(*supra,* 185). And so could, one should add, negligence and inefficiency on the part of the crew, or some breakdown of the supposedly fail-safe equipment. As Dumas observes "[w]e have created a world in which perfection is required if a disaster beyond history is to be permanently avoided. But in the world of human beings perfection is unachievable" (*supra,* note 55, 20).

Planned recklessness on the part of the national military establishments could also lead to unintentional catastrophe. For example, American submarines, routinely used for electronic intelligence gathering, according to the U.S. Navy's own admission, have on occasion in pursuit of this objective, sailed submerged as close as three miles off the Soviet shore, well within the territorial sea of the U.S.S.R. (Middleton, *supra,* 209). Considering the grave concern expressed by Washington when in 1975 a Soviet nuclear submarine had been detected 350 miles off Cape Cod, it is easy to imagine what the American reaction would have been had a Soviet submarine been discovered three miles off the U.S. coast, or worse, had the Russians attacked and sunk the U.S. submarine caught within their territorial waters (*ibid.,* 208).

When to these, already existing and barely manageable hazards, new space weapons systems are added, the inherent instability of nuclear deterrence cannot but give way to a catastrophe. Regrettably, no recent arms-control negotiations have shown sufficient concern for the urgent need to reduce to tolerable levels these risks.

[105] As reported in Time (July 11, 1978), 8.

other nuclear explosion, in the atmosphere, in outer space, and under water.[106] Apart from these limitations, at present applicable to the 105 nations which are party to the Treaty, all that general international law required before 1967 was that states conduct their space activities in a manner that would assure equal rights and peaceful enjoyment to every other user of the new environment. Thus, until 1967, the legal regime for space resembled that designed to govern the high seas. While a series of U.N. General Assembly resolutions, passed during the preceding decade, repeatedly stressed the common interest of all mankind in the exploration and use of outer space for the benefit of all nations, not one of those resolutions, not even the *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space* of 1963, either mentioned or banned arms in space. Although some states and a number of jurists argued that the term "peaceful", as employed in various U.N. documents, could not be reconciled with military activities, there was no unanimity on this issue. Consensus existed on one fundamental point only, namely, that access to outer space should be free to all nations on an equal basis. Well before the signing of the *Outer Space Treaty*, the principle of freedom came to be universally regarded as a principle of a new and evolving customary law.[107]

The pledge, jointly made in 1963 by the U.S.S.R. and the United States, not to station in outer space any objects carrying nuclear weapons or other kinds of weapons of mass destruction was merely an informal bilateral understanding, lacking the force of a legal obligation.[108] Even if in view of the subsequent judgment of the International Court of Justice in the *Nuclear Tests Case*[109] one should consider this bilateral statement as a binding obligation, it would still bind only the two parties to the pledge. As such, it would not be a legal norm of world-wide application.

The adoption of the *Outer Space Treaty* brought about substantive changes in the legal regime of outer space. What had been before, with the likely exception of the principle of freedom of access, merely a set of non-binding guidelines, became now a legal obligation. Since the Treaty holds the central position within the juridical

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[106] Art. I(1)(a).

[107] See, *e.g.*, McDougal, Lasswell & Vlasic, *supra*, note 43, 200 *et seq.*; Goedhuis, *supra*, note 38, 207.

[108] U.N. Doc. A/Res. 1884 (XVIII), Oct. 17, 1963.

[109] *Nuclear Tests* (Australia v. France), *Judgment of 20 December 1974, I.C.J. Reports 1974*, 253, digested in (1975) 69 Am. J. Int'l L. 668. On the same day, the Court gave a similar judgment in *Nuclear Tests* (New Zealand v. France), *I.C.J. Reports 1974*, 457.

framework governing all uses of space, it is necessary in the context of this inquiry to examine carefully those of its provisions which are relevant to the military activities in outer space. An analysis of the Treaty and other pertinent legal instruments against the background of military space developments since 1967 should provide an opportunity to assess the measure of compliance by the major powers with their formal obligations. Such an examination can also highlight the more serious gaps and ambiguities in this body of law which allow a few states to frustrate the fundamental interests of the community of nations in outer space.

The "general rules of interpretation" of international agreements, found in article 31 of the Vienna *Convention on the Law of Treaties*,[110] prescribe, in part, as follows:

1. A treaty shall be interpreted in good faith in accordance with the *ordinary meaning* to be given to the terms of the treaty in their context and in the light of its *object and purpose.*
2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, *including its preamble....*
3. There shall be taken into account, together with the context: ...
   (c) any relevant rules of international law applicable in the relations between the parties.
4. A special meaning shall be given to a term if it is established that the *parties so intended.*[111]

The preamble to the *Outer Space Treaty* contains phrases which leave no doubt that the parties intended to create a legal regime to make the space environment serve, pre-eminently and perpetually, the cause of peace, international cooperation and general well-being. If during the negotiations of the Treaty, some of the parties harboured contrary ideas, their expectations are not reflected in the preamble. Except for practitioners of Orwellian "newspeak", the wording allows but one interpretation.

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[110] U.N. Doc. A/Conf. 39/27 (May 23, 1969); (1969) 63 Am. J. Int'l L. 875; (1969) 8 Int'l Leg. Mat. 679. The Convention entered into force on Jan. 27, 1980: for a commentary, see Kearney & Dalton, *The Treaty on Treaties* (1970) 64 Am. J. Int'l L. 495.

[111] [Emphasis added.] On the techniques and objectives of treaty interpretation, see McDougal, Lasswell & Miller, *The Interpretation of Agreements and World Public Order* (1967). See also Whiteman, *Digest of International Law* (1970), Vol. 14, 353; Brownlie, *Principles of Public International Law*, 3d ed. (1979), 623.

In the operative part of the Treaty, article I reiterates the same theme:

> The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, ... and shall be the province of all mankind.

Article III obliges the parties to conduct their activities in outer space "in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding." The primacy of the common interest of all nations is stressed again in article IX of the Treaty. The opening sentence of that article requires contracting states to be guided in the exploration and use of outer space "by the principle of co-operation and mutual assistance", and to "conduct all their activities in outer space ... with due regard to the corresponding interests of all other States Parties to the Treaty."

Article IV contains the only provision of the *Outer Space Treaty* specifically addressed to military activities. Under paragraph 1 of this article, the contracting parties "undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner." This prohibition has its origin in a bilateral pledge by the United States and the Soviet Union, later unanimously adopted as a resolution of the U.N. General Assembly.[112] Whether inadvertently or intentionally, paragraph 2 of article IV omits any mention of "outer space" and specifies the "Moon and other celestial bodies" as the areas of space which must be used "exclusively for peaceful purposes". Echoing article I(1) of the *Antarctic Treaty*,[113] the same paragraph stipulates further 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 shall be forbidden." Ironically, by specifying prohibited activities in space, article IV, particularly its second paragraph, has often been cited, not without some justification, in support of the claim that the Treaty allows all military uses of outer space which are not explicitly forbidden.[114] Thus the Treaty stipulation that was

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[112] *Supra*, note 108.

[113] Signed in Washington, Dec. 1, 1959, entered into force June 23, 1961: (1961) 402 U.N.T.S. 71; (1960) 54 Am. J. Int'l L. 476. Nineteen countries have ratified or acceded to this treaty.

[114] See, *e.g.*, Lay & Taubenfeld, *The Law Relating to Activities of Man in Space* (1970), 25 *et seq.*, especially 97-102; Stein, *Legal Restraints in Modern Arms Control Agreements* (1972) 66 Am. J. Int'l L. 255, 262-4. In direct

supposed to curb the militarization of outer space has had the opposite effect in practice. Major space powers have demonstrably been acting on the premise that whatever is not prohibited *verbis expressis* by the Treaty is permissible, and therefore lawful. While the document as a whole does not permit such an interpretation, the muddled text of article IV can be used, and has been used, to undermine the legally and politically sounder interpretation.

Arguments supporting the lawfulness of military activities in space have also been aided by the failure of the *Outer Space Treaty* and U.N. General Assembly resolutions to define the term "peaceful purposes". As a result, a group of states led by the United States has consistently espoused the view that the term prohibits only "aggressive" uses of outer space while permitting "non-aggressive" military activities.[115] The contrary view — uniformly accepted in socialist jurisprudence but not followed in practice by the Soviet Union — equates "peaceful" with non-military use.[116] Accordingly, it regards all military activities in outer space as inconsistent with the letter and the spirit of the Treaty. Probably reflecting the steady expansion of their own military space arsenal, the official position of the U.S.S.R. on these issues has undergone a subtle change during the 1970's. In the apt and still valid assessment of Lay and Taubenfeld, the current Soviet view "seems to be that the military use of space is without legal characterization, and will remain so until agreement is reached on general and complete disarmament."[117]

The opinions of legal commentators on the crucial question of peaceful and non-peaceful uses of outer space exhibit a similar lack of consensus, although a substantial majority, cutting across ideological frontiers, decries the militarization of space. Manfred Lachs, judge of the World Court and former Chairman of the U.N. Outer Space Committee, has "little doubt as to the real meaning"

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reference to ASAT weapons, Douglas J. Bennett, Assistant Secretary of State, asserted in 1977 that the Treaty does not "contain any specific prohibition against the development of an anti-satellite capability." As far as art. IX of the Treaty is concerned, Bennett noted that so long as activities or experiments for the development of such weapons systems do not cause "potentially harmful interference", they are not in violation of the Treaty (United States Department of State, *Digest of United States Practice in International Law, 1977* (1979), 665-6).

[115] See sources cited in note 114, *supra.*

[116] Gal, *Space Law* (1969), 164, 180-1; Lachs, *The Law of Outer Space: an Experience in Contemporary Law-making* (1972), 106-8: see also *Soviet Space Programs, supra,* note 30, Vol. 1, 375-80.

[117] *Supra,* note 114, 99.

of these controversial words.[118] In Lachs's view, if only the prohibition of "aggressive" uses had been contemplated, there would have been no need to make any reference in the Treaty to "peaceful purposes". The addition of these words, he argues, "can therefore hardly be considered as meaningless, the expression of a pious desire devoid of legal effects."[119] According to Judge Lachs, "it is the immediate context of the words which underlines their importance and makes their meaning unequivocal."[120] Recognizing, however, that the goal of demilitarized outer space has not been achieved, the Treaty notwithstanding, Lachs suggests the "formal outlawing of military activities" as an objective which is "both realistic and attainable."[121] Professor Marcoff, in his comprehensive treatise on the law of outer space, is even more emphatic than Lachs in rejecting the characterization of the term "peaceful" as allowing arms in space:

> Il s'ensuit qu'aucune exploration et utilisation de l'espace ne doivent être destinées à des fins stratégiques servant les intérêts d'un Etat particulier, ou d'un groupe d'Etats. Dans les circonstances qui caractérisent les rapports interétatiques d'aujourd'hui, aucune activité de nature stratégique, même quand elle n'est pas agressive mais simplement 'défensive', n'est en état de satisfaire cette condition primordiale, introduite de façon formelle par le droit spatial positif.[122]

The position taken by the Indian author Bhatt is fairly typical of the school of thought that regards military uses of outer space as permissible under the Treaty of 1967. While noting the "universal consensus among the non-space powers on the harmful effects of the military uses of outer space", in this view such uses "as do not involve violence may be indulged in by states for reasons of security."[123]

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[118] *Supra*, note 116, 106.

[119] *Ibid.*

[120] *Ibid.*, 106-7.

[121] *Ibid.*, 107.

[122] Marcoff, *Traité de droit international public de l'espace* (1973), 357. See also Mateesco-Matte, *La "Charte de l'Espace" à l'heure de l'anniversaire* (1979) 4 Annuaire de droit maritime et aérien 311, 326; Pazarci, *Sur le principe de l'utilisation pacifique de l'espace extra-atmosphérique* (1979) 83 Rev.gén.droit int.pub. 986.

[123] Bhatt, *Legal Controls of Outer Space* (1973), 175-6. See also Ogunbanwo, *International Law and Outer Space Activities* (1975), 101; Goedhuis, *The Changing Legal Regime of Air and Outer Space* (1978) 27 Int'l & Comp. L. Q. 576, 584-5; Zedalis & Wade, *Anti-Satellite Weapons and the Outer Space Treaty of 1967* (1978) 8 Cal. W. Int'l L.J. 454, 479-81; Robinson, *Militarization and the Outer Space Treaty — Time for a Restatement of Space Law* Astronautics & Aeronautics (Feb., 1978), 26; Gorove, *Studies in Space Law: its Challenges and Prospects* (1977), 85-94; Matte, *Space Policy and Programmes Today and*

The assertion that the term "peaceful purposes" in the *Outer Space Treaty* excludes all military activities finds its most convincing support in the *Antarctic Treaty* of 1959. The opening sentence of article I(1) of that Treaty simply states that "Antarctica shall be used for peaceful purposes only." But in the next sentence, clearly of a definitional scope, the agreement explicitly bans "*inter alia*, any measures of a military nature, such as the establishment or military bases and fortifications, the carrying out of military manoeuvers, as well as the testing of any type of weapons." It is encouraging to note that, despite the rampant arms race in all environments accessible to man, Antarctica has up to now remained unaffected by this trend. The continuing success in keeping Antarctica free of arms proves that when, by international agreement, an area is denied to the military *ab initio* it can remain arms-free indefinitely. By contrast, once the military gain even a modest foothold in a hitherto virgin environment, their presence tends to grow, making eventual demilitarization of the region nearly impossible, as has been the case with outer space, air space, and the oceans. The *Antarctic Treaty* stands as a towering tribute to the farsightedness of its sponsors and as a convincing proof of the material contribution that international law can make to the goal of a safer world.[124]

It is worth stressing that, since the early days of space exploration, efforts to close outer space to arms competition have also been hampered by the unfortunate fact that essentially the same technology could serve both civilian and military objectives. For example, satellites designed to monitor earth resources can also be used for military surveillance;[125] similarly, civilian communications, meteorological and navigation satellites are for all practical purposes indistinguishable from space vehicles providing the same service to the military. No wonder that the defence

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To-morrow (1980), 68; Lay, *Space Law: A New Proposal* (1980) 8 J. Space L. 41, 45.

[124] A recent appraisal by the U.S. State Dep't found the *Antarctic Treaty* "an unusually successful example of international cooperation among states with differing political systems as well as different legal and political perspectives" (*Antarctica: 10th Meeting of Treaty Consultative Parties* 79 Dep't State Bull. (Nov., 1979), 21). For an analysis of the Treaty, see Taubenfeld, *A Treaty for Antarctica* (International Conciliation, No. 531, 1961); see also Hambro, *Some Notes on the Future of the Antarctic Treaty Collaboration* (1974) 68 Am. J. Int'l L. 217.

[125] An illustration of this duality of function was recently provided by the U.S. decision to allow China access to the American Landsat-D earth resources satellites, to be used by Peking for military reconnaissance (N.Y. Times (Jan. 9, 1980), A-9, col. 1): see also *supra*, note 59.

management of both super-powers has been from the outset deeply involved in almost all phases of space science and technology. Given these factors, a degree of militarization of outer space has probably been unavoidable in conditions of intense power-bloc rivalries. However, although no nation which took part in the negotiation of the *Outer Space Treaty* could realistically have hoped for the super-powers, in deference to the Treaty, to terminate or seriously curb their defence activities in space, it is certain that none anticipated the subsequent massive growth of the military presence in this environment. The awesome quantitative and qualitative expansion between 1967 and 1980 of the Soviet-American military space systems can be said to have exceeded even the most pessimistic expectations of the 1960's. If this trend could have been reasonably predicted during the negotiations of the Treaty, it is doubtful that the accord in its present form would have come into existence. Few countries outside the NATO and the Warsaw Pact alliances would have been willing to endorse an agreement which *de facto*, if not *de jure*, assures a handful of the most powerful states a large degree of freedom to turn this common domain into an arena of bilateral arms competition to the detriment of all the others. The majority of negotiating countries were apparently willing to permit a limited and virtually unavoidable amount of military space uses, hoping that genuinely "peaceful" activities, along with international co-operation for the common benefit, would overshadow and eventually eliminate pursuits exclusively in the cause of power-bloc interests. As the record shows, their tacit acceptance of the use of contemporary, unsophisticated space technology for military surveillance, weather-reporting and telecommunications, has been interpreted by the super-powers as licence for an almost unrestricted arms race in outer space. From an essentially auxiliary, non-offensive instrument of the 1960's, military space technology, under a self-serving interpretation of the *Outer Space Treaty*, has grown in the 1970's into an instrument that threatens peace not only in space but on earth as well. Yet the cumulative effect of the directives contained in the preamble and in the operative part of the Treaty, more than any single specific stipulation in it, suggests convincingly that the present level of "defence" activities in space is contrary to the letter and the spirit of the document. These activities also contradict the often repeated declarations made by the highest officials of the major powers about the goals their respective countries seek in outer space.[126]

[126] "By proceeding with the development of the anti-satellite systems and other military satellite systems the two space powers are seriously contravening the spirit — if not the letter — of the Outer Space Treaty which

B. *The obligations of states under the arms-control agreements*

Less than a year after the entry into force of the *Outer Space Treaty*, the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT) was opened for signature on July 1, 1968 at the initiative of the great powers.[127] The principal purpose of the NPT is to prevent the spread of nuclear weapons (articles I and II) and to promote the peaceful uses of nuclear energy through cooperation under appropriate international safeguards (articles IV and V). To help achieve these ends, all parties to the Treaty, particularly the nuclear-weapon states, have undertaken 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 ..." (article VI).[127a] Although the commitment to pursue both arms control *and* disarmament negotiations expeditiously and in good faith is a legal obligation as well as a cornerstone of the NPT, major nuclear powers have consistently acted in violation of this crucial undertaking. Not surprisingly, many potential nuclear-weapon states, together with France and China, have been reluctant to become a party to this agreement in view of the relentless vertical proliferation of nuclear weapons and their delivery systems by the United States and the U.S.S.R.[128] Thus the super-powers bear the principal responsibility for the continuing ineffectiveness of the NPT, as witnessed by the addition since 1969 of perhaps three new members to the nuclear-weapons club (India, probably Israel and possibly South Africa).[129] The

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they themselves proposed" (Matte, *supra*, note 123, 68). See also Lay, *supra*, note 123, 51. The conditions created in outer space by the U.S. and the U.S.S.R. since the conclusion of the *Outer Space Treaty* seem to fit well the requirements of art. 62 of the Vienna *Convention on the Law of Treaties* for the invocation by other parties of the concept of a "fundamental change of circumstances". However, resort to such a drastic action would likely accelerate rather than arrest further militarization of outer space.

127 (1970) 729 U.N.T.S. 161. The Treaty entered into force on March 5, 1970 and, as of Sept., 1979, has been ratified or acceded to by 111 states (79 Dep't State Bull. (Nov., 1979), 49).

127a [Emphasis added.]

128 Former Director of the U.N. Disarmament Office, William Epstein, observes that a large number of non-nuclear states "are becoming disillusioned by the failure of the nuclear powers to live up to their obligations under the NPT", and see the SALT agreements "as mere blueprints for the continuation of the nuclear arms race by the two superpowers" (*Canada and the Problem of Nuclear Proliferation* Proc. of the Fifth Ann. Conf. of the Can. Council on Int'l L. (1976), 55, 61).

129 See *supra*, note 26. According to a team of B.B.C. reporters, Pakistan is on the verge of producing a nuclear bomb (The [Montreal] Gazette (June

special relevance of the NPT in the context of this inquiry is to emphasize the existence of an unambiguous legal obligation, freely assumed by the major powers in a multilateral treaty of world-wide application, to begin a meaningful arms reduction process. Although article VI of the NPT does not explicitly call for an end to the arms race in outer space, its reference to "general and complete disarmament" is obviously broad enough to encompass also the space environment. Because of its purpose and wide acceptance, the NPT provides, next to the *Outer Space Treaty*, the most solid legal basis for nations which are parties to these texts for demanding from the super-powers compliance with the provisions of article VI.

Bilateral arms-control agreements concluded in recent years between the Soviet Union and the United States, in the most optimistic estimates, have only marginally affected the strategic weapons competition and have had no effect at all on the overall global arms build-up. These agreements are widely perceived as amounting to a little more than a verbal commitment to the goals of arms control and disarmament. With evident justification, they are seen as an effort by the super-powers to restrict, modestly, certain of their cost-ineffective or ageing strategic weapons, while allowing the unhindered development of more promising, and often more lethal, instruments of violence. The *ABM Treaty* of 1972,[130] the backbone of the SALT process, provides a good illustration. Under this Treaty, the United States and the U.S.S.R. have agreed, in order to minimize the pressures of technological change and its destabilizing effect on the strategic balance, "not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based" (article V(1)). Article IX prohibits the deployment outside the national territory of the parties

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17, 1980), 1, col. 1). Epstein estimates that by 1986 thirty-nine countries could become, if they so decided, nuclear-weapon states (*The Last Chance* (1976), 234). See also Schütze, "A World of Many Nuclear Powers" in Griffiths & Polanyi, *The Dangers of Nuclear War* (1979), 85. The second five-year review conference of the NPT states, held in Geneva during August and September, 1980, ended in complete failure, without even an agreed statement in support for the treaty (see *Final Document of the Second Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons* NPT/Conf. II/22 (Sept. 7, 1980)). Final Declaration of Non-Governmental Organization Observers to the Review Conference noted "with dissatisfaction that intensive testing activities of the nuclear-weapon States Party continue unabated and that multilateral negotiations for a comprehensive test ban treaty in the [U.N.] Committee on Disarmament have not yet begun" (full text in Disarmament Times (Sept. 5, 1980), 2).

[130] Text in *Arms Control and Disarmament Agreements*, *supra*, note 10, 132. For a thorough analysis, see Willrich & Rhinelander, *supra*, note 14.

of such ABM systems as are limited by the Treaty. While the agreement clearly prohibits ABM weapons in outer space, it does not seem to forbid directed-energy devices designed to function as anti-satellite weapons. And since it may be impossible to distinguish between ABM directed-energy space vehicles and those deployed exclusively for anti-satellite purposes, this apparent loophole in the Treaty could be exploited to introduce such weapons into outer space. The possibilities for circumventing, if not the letter of the Treaty then certainly its declared spirit, seem enhanced by the provisions of article VII, which allow the modernization and replacement of existing ABM systems within prescribed limits. The only spacecraft enjoying protection under this agreement are those used by the parties as their "national technical means of verification" of compliance with the SALT agreements (article XII).

The precarious stability in the development of strategic weapons established by the *ABM Treaty* is further weakened by its termination clauses. Although of unlimited duration, the Treaty, in common with other arms-control texts, gives each party the right to withdraw, on a six months notice, "if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests" (article XV). The requirement that the party choosing to abrogate the Treaty must specify, in its notice of withdrawal, the reasons for its action still gives wide latitude to both parties in the selection of such reasons. And the past behaviour of the major powers, when their national security interests (whether genuine or contrived) are involved, does not inspire optimism. Reported experimentation in anti-ballistic and anti-satellite weaponry based on directed-energy could legitimately be invoked by either nation as the kind of "extraordinary event" justifying notice of withdrawal.[131]

Yet in the *ABM Treaty* itself the two powers laid stress on their obligation under article VI of the NPT and declared their resolve "to achieve at the earliest possible date the cessation of the nuclear

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[131] Despite the *ABM Treaty*, research and development of anti-ballistic missile weapons systems continues unabated, accompanied by growing pressures of the military-industrial complex for greater efforts. U.S.S.R. is reported to be spending about $1 billion a year on ABM research, whereas the U.S. Defence Dep't budget for 1981 allocates $265 million for these activities (N.Y. Times (March 24, 1980), A-19, col. 1). See also N.Y. Times (Nov. 25, 1979), 37, col. 1 (U.S. Senator Malcolm Wallop urging rapid development of space-based ABM systems); Flight Int'l (April 12, 1980), 1123 (quoting a U.S. General's claim of "outstanding progress in a wide spectrum" of ABM research and development); AWST (Oct. 8, 1979), 15; AWST (July 28, 1980), 32 (reporting that a re-evaluation of the Treaty has been undertaken by the U.S. Administration).

arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament" (preamble). Similarly, in the *Agreement on the Prevention of Nuclear War* (1973),[132] the United States and the Soviet Union pledged themselves to pursue policies designed to "remove the danger of nuclear war" and to "act in such a manner as to prevent the development of situations capable of causing a dangerous exacerbation of their relations, as to avoid military confrontations ..." (article I). Comparable undertakings can be found in the preambles to both the *Treaty on the Limitation of Underground Nuclear Weapons Tests* (1974)[133] and the *Treaty on Underground Nuclear Explosions for Peaceful Purposes* (1976).[134] In the latter accord, the two countries reaffirmed "their adherence to the objectives and principles" of the *Limited Nuclear Test Ban Treaty* of 1963, the NPT and the *Treaty on the Limitation of Underground Nuclear Weapon Tests,* and expressed their "determination to *observe strictly* the provisions of these international agreements" (preamble).[135] Despite all these binding pledges, competition between the super-powers in strategic and conventional armaments in every environment accessible to man is becoming ever more virulent. Moreover, as many observers contend, the increasing accuracy of nuclear delivery systems being perfected in the shadow of these accords, together with the developments in ABM and outer space techniques, seriously threaten the doctrine of "mutual assured destruction" and hence the military foundations of détente.[135a]

Admittedly, non-compliance by one or both parties with the provisions of a bilateral agreement does not, as a rule, entitle a third party to demand performance. However, since the subject-matter of these Soviet-American treaties is the global arms race, surely all

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[132] Text in *Arms Control and Disarmament Agreements, supra,* note 10, 153.

[133] Preamble: for text, *ibid.,* 158.

[134] *Ibid.,* 162.

[135] [Emphasis added.] Although not a formal legal obligation, Principle 26 of the unanimously adopted U.N. Declaration on the Human Environment places upon states at least a strong moral obligation. The Principle stipulates, *inter alia,* that "states must strive to reach prompt agreement ... on the elimination and complete destruction" of nuclear weapons and all other means of mass destruction (*Report of the United Nations Conference on the Human Environment, held at Stockholm, 5-16 June 1972,* U.N. Doc. A/Conf. 48/14 (July 3, 1972)). For a thoughtful appraisal of this document, see Sohn, *The Stockholm Declaration on the Human Environment* (1973) 14 Harv. Int'l L. J. 423.

[135a] See, *e.g.,* Aldridge, *Missile Killers: The Hidden Arms Race* The Nation (Oct. 18, 1980), 368, 371. The U.S. and the Soviet Union both are reportedly working on a new magnetic "railgun" which could be used in outer space and for a surprise missile attack (N.Y. Times (Nov. 11, 1980), C-1, col. 1).

nations have a vital and legitimate concern in assuring that the obligations assumed by the great powers are being implemented.[136] This is all the more so in view of the fact that the major powers, by virtue of their status in the Security Council of the United Nations, have a special responsibility to honour their treaty commitments, particularly when they directly affect international peace and security.[137] In circumstances considerably less formal than those existing under a treaty, the International Court of Justice found it possible in the *Nuclear Tests Cases*[138] to establish a legal obligation owed by France. The Court ruled that; through the unilateral statements of its high officials, the French government had indicated its intention — and therefore assumed a legal responsibility — to terminate the atmospheric nuclear tests to which Australia and New Zealand had formally objected. The judgment pointedly noted that the "validity of these [French] statements and their legal consequences must be considered within the general framework of the security of international intercourse, and the confidence and trust which are so essential in the relations among States."[139]

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[136] This universal concern is explicitly articulated in the *Final Document* of the 1978 U.N. Special Session on disarmament. The Declaration adopted at this historic session, *e.g.*, in § 14 reads: "Since the process of disarmament affects the vital security interests of all States, they must all be actively concerned with and contribute to the measures of disarmament and arms limitation ...". § 28: "All peoples of the world have a vital interest in the success of disarmament negotiations. Consequently, all States have the duty to contribute to efforts in the field of disarmament. All States have the right to participate on an equal footing in those multilateral disarmament negotiations which have a direct bearing on their national security" (U.N. Doc. A/Res./S-10/2 (July 13, 1978), 6, 8).

[137] It is of some interest to quote here the almost forgotten draft "Code of Offences against the Peace and Security of Mankind", adopted by the U.N. International Law Commission on July 28, 1954. Art. 2(7) of the Code includes among such offences: "Acts by the authorities of a State in violation of its obligations under a treaty which is designed to ensure international peace and security by means of restrictions or limitations on armaments, ... or of other restrictions of the same character." Offences defined in the Code are regarded as "crimes under international law, for which responsible individuals shall be punished" (art. 1) (text in U.N. Doc. A/2693, 9 GAOR, Supp. No 9 (1954); Sohn, *Basic Documents of the United Nations*, 2d rev. ed. (1968), 105. In a resolution adopted on Dec. 16, 1978, the U.N. General Assembly has decided to accord in its work this draft Code "priority and the fullest possible consideration" (U.N. Doc. A/Res./33/97 (Jan. 23, 1979)).

[138] *Supra*, note 109.

[139] *I.C.J. Reports 1974*, 269. In praising the Court's decision, Professor Thomas M. Franck concludes that "each state must now recognize that what it solemnly says it will do, or, more important, what it says it will not d , becomes a part of that trellis of reciprocal expectations on which the fragile

C. *Commitments undertaken at the Helsinki Conference, 1975*

Soon after its signing in August, 1975, the *Final Act of the Conference on Security and Cooperation in Europe* (the "Helsinki Declaration")[140] became one of the most frequently invoked international documents in the defence of human rights. Successive presidents of the United States and other Western statesmen have on many occasions called for its observance and at times even threatened sanctions against the signatory states accused of violations of the commitments assumed.[141] The Helsinki *Final Act* is already established as the most effective human rights text in existence, second only to the U.N.'s *Declaration on Human Rights* (1948). Although opinions vary as to the extent of the Act's implementation and the strategies used in the efforts to enforce it, few have questioned the actual and potential contribution of this text to the promotion of human rights everywhere. There is also a broad consensus in the legal characterization of the Act; while it is not a binding juridical document, its provisions are meant to be carried out because they are consistent with international law.[142] It is less than a treaty but much more than any resolution of the U.N. General Assembly.

Frequent references to the human-rights clauses of the *Final Act* by Western governments, media and academics have largely obscured the fact that this lengthy document consists of *three* major parts, all of equal legal force. In addition to their pledge to promote agreed human rights, the thirty-five participating states also expressed in the preamble to the text their determination to give "full effect to the results of the Conference" in matters of security in Europe and cooperation in the fields of economics, science and technology, and the environment. While the advancement of basic human rights in Europe and throughout the world at all times merits maximum effort, it is unfortunate and short-

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international system grows" (*Word Made Law: The Decision of the ICJ in the Nuclear Test Cases* (1975) 69 Am. J. Int'l L. 612, 616). For a critique of the judgment, see Macdonald & Hough, *The Nuclear Tests Case Revisited* (1977) 20 German Yb. Int'l L. 337; Rubin, *The International Legal Effects of Unilateral Declarations* (1977) 71 Am. J. Int'l L. 1.

[140] Text in (1975) 14 Int'l Leg. Mat. 1292. The *Final Act* was signed by thirty-five nations.

[141] See, *e.g.*, Henkin, *Rights: American and Human* (1979) 79 Colum. L. Rev. 405; Balthazar, *President Carter and Human Rights: the Contradiction of American Policy* Int'l Perspectives (May-June, July-Aug., 1979), 22.

[142] Russell, *The Helsinki Declaration: Brobdingnag or Lilliput?* (1976) 70 Am. J. Int'l L. 242, 246-8. The *Final Act* "is not eligible for registration under art. 102 of the [U.N.] Charter" (final clauses).

sighted if governments focus entirely on a single "basket" in the Act, to the total exclusion of stipulations concerning the arms race which are at least as important. Although references to disarmament in the *Final Act* are, for obvious reasons, far less specific than those relating to human rights, the document does contain a pledge by the signatory states to "take effective measures which by their scope and by their nature constitute steps towards the ultimate achievement of general and complete disarmament under strict and effective international control".[143] The Act also calls upon parties to engage in joint efforts aimed at reducing military confrontation and at promoting détente.

That the current spiralling arms competition is inimical to the goals of basic human rights is obvious, though rarely reflected in the policies of states. The unrestrained development and acquisition of weapons not only diverts badly needed material and human resources to unproductive ends;[144] it also threatens all societies, including present-day democracies, with the prospect of eventually becoming garrison states. Throughout history the worst violations of the fundamental human rights — rights to life and liberty — have been committed in conditions of high tension and armed con-

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[143] *Final Act*, Questions relating to security in Europe, 1(b)(i). A similar pledge appears in s. 2(II) of the Act ("Questions relating to disarmament").

[144] "The arms race represents a waste of resources, a diversion of the economy away from its humanitarian purposes, a hindrance to national development efforts and a threat to democratic processes. But its most important feature is that in effect it undermines national, regional and international security" (*Economic and Social Consequences of the Arms Race and of Military Expenditures, supra*, note 25, 58). It is highly doubtful that even the U.S. will much longer be able to endure the staggering cost of the arms race without progressively eroding and eventually destroying its society for the defence of which the weapons are ostensibly being acquired. Professor E. Rothschield of M.I.T., noting that in 1970, during a period of decline in U.S. military spending, a fifth of its engineers and mathematicians, a fourth of its physicists, and almost half of its aeronautical engineers worked on defence-related projects, concludes: "An economy in the throes of decline cannot afford to lose this portion of its knowledge, of its educational system, of its future to ... destruction" (*Boom and Bust: Department of Defense Annual Report, Fiscal Year 1981* N.Y. Rev. of Books (April 2, 1980), 31, 34). According to a staff member of the U.S. Senate, "[a]s much as half of all research and development expenditure in the United States is now oriented toward military production" (Bartlett, *Return of the War Economy* Inquiry (March 17, 1980), 12, 14). The price of arms competition to the Soviet Union is even higher. There the insatiable demands of the national defence apparatus are preventing limited resources from reaching the civilian population to help alleviate the perennial scarcity of consumer goods and services.

flict.[145] Regrettably, evidence is still scarce that contemporary political leaders and opinion-makers are ready to treat the arms race as a phenomenon incompatible with human rights and to see its continuation as the principal obstacle to the fuller implementation of the U.N. Declaration of 1948 and the Helsinki *Final Act*.[146] Prolonged indifference to the undertakings on disarmament contained in the Helsinki *Final Act* cannot but weaken or even eventually destroy the effectiveness of its human rights provisions.

IV. The arms race and its impact on space uses and their legal regulation

Apart from its destabilizing effect on the security of all nations, the extension of the arms competition to outer space has already adversely affected both the uses of outer space and the process of their legal regulation. The ensuing survey highlights some consequences of the growing militarization of space for the maintenance of peace in the arena of outer space, the delimitation of outer space, the use of geostationary orbit, and the preservation of the environmental integrity of the earth-space domain.

A. *Proliferation of military space powers*

In the preceding pages an attempt was made, by focusing on the two principal space powers, to illustrate the growing scope of military activities in outer space. But these two countries no longer hold a monopoly on such activities. China has recently acknowledged its own military space-reconnaissance programme,[147] without specifying how many of its nine orbiting satellites serve this func-

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[145] Despite scores of international declarations, covenants and resolutions hailing the sanctity of life and of the human person, the technological arms race has been successful in promoting the "belief that national interest is total, that of man inconsequential. So, even the prospect of total death and destruction does not deter us from developing new weapons systems if some thread of national interest can be identified in the outcome. We can accept 75 million casualties if it forces the opposition to accept 150 million" (Galbraith, "Controlling the Military" in Beitz & Herman, *Peace and War* (1973), 332, 337).

[146] If not before, then as of Dec. 15, 1978, the right to life in peace has been added to the body of human rights. On that date, the U.N. General Assembly adopted by 138-0, with two abstentions, a "Declaration on the Preparation of Societies for Life in Peace". Principle 1 of the Declaration reads in part: "Every nation and every human being ... has the inherent right to life in peace. Respect for that right, as well as for other human rights, is in the common interest of all mankind" (U.N. Doc. A/Res./33/73 (Jan. 16, 1979)).

[147] AWST (June 25, 1979), 77, 81; AWST (July 9, 1979), 18.

tion. France, a self-sufficient space power, is also developing surveillance satellites for resource monitoring and military observation, with the launching date set for 1984.[148] At the present time, no other nation is known to be developing or planning a separate national system of military satellites. That situation, however, could change much faster than in the case of the proliferation of nuclear weapons. When a poor and technologically underdeveloped country like China can succeed without external aid in creating its own nuclear-weapons arsenal and an outer space capability,[149] it is only prudent to expect that other nations, particularly advanced industrial countries, can duplicate or even surpass the Chinese accomplishments with relative ease. All they need to push them in that direction is an appropriate stimulant, and that is being provided by the two super-powers. Western Europe is already emerging as a major developer of advanced space technology. Indications abound of the determination of the member countries of the European Space Agency (ESA) to become an independent force in this field and thus break the Soviet-American domination in space exploration and use.[150] While the ESA's efforts have so far been limited to civilian programmes, this may not continue indefinitely.

The Third World nations, increasingly impatient with the unwillingness of the major powers to end their arms race, may decide before long that their national interests also demand the acquisition of the most modern weaponry, including military spacecraft. India, for example, already regarded as a nuclear-weapons power, is expected to achieve space-launching capability in the early 1980's. Developing nations which lack India's resources, or are unable to acquire military space technology from the advanced countries, could nonetheless join the space club by other means, as, for example, through an organization such as the Orbital Transport and Rocket Company (OTRAG).[151] Until its reported expulsion from

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[148] AWST (June 12, 1978), 21; AWST (Feb. 4, 1980), 11; Air & Cosmos (Sept. 1, 1979), 34. See also statement by President Giscard d'Estaing at the U.N. Special Session on disarmament (U.N. Doc. A/S-10/PV.3 (May 25, 1978), 16).

[149] In May, 1980, China successfully launched an intercontinental ballistic missile, capable of carrying a nuclear warhead, to a distance of almost 7,500 miles (Int'l Herald Tribune (May 19, 1980), 1, col. 1; Int'l Herald Tribune (May 22, 1980), 5, col. 2).

[150] An important step in that direction occurred on Dec. 24, 1979, when the ESA nations successfully launched from a facility in French Guyana their first space rocket "Ariane" (Interavia (Feb., 1980), 116).

[151] A revealing report on OTRAG and its activities in Zaire appears in Tibenham, *Fire in the Heavens* The Listener (Oct. 19, 1978), 490. See also Interavia (April, 1978), 310.

Zaire in 1979,[152] this private German company was developing defence space hardware there for several years for sale to less affluent countries. The danger is that military spacecraft might, like other advanced weaponry, become a status symbol to be acquired by determined nations at relatively little cost.

Any increase in the number of states with military space capabilities could easily escalate so as to create complex problems for arms-restraint negotiations. In the meantime, the potential for conflict and mischief would increase sharply. This trend could be facilitated by the lack of any legal restraint, apart from article IV of the *Outer Space Treaty,* on the number and nature of satellites each country is free to launch. As has already been said, the SALT I and II agreements cover military satellites only to the extent of forbidding interference with spacecraft used as national technical means for verifying these agreements. The feeble attempt to negotiate a ban on anti-satellite weapons ran into serious difficulties even before the recent revival of the Cold War. "Deep Soviet concern over the growing Chinese capability in space",[153] as well as other "concerns", was given as a significant obstacle to progress in these Soviet-American negotiations. In sum, space law and arms control treaties, as interpreted by the super-powers, have failed to place any meaningful constraints on the militarization of outer space.

B. *Outer space boundaries*

The question of where sovereign air space ends and free outer space begins has been tantalizing international lawyers and diplomats almost since the first orbit of Sputnik I.[154] This was to be expected once the community of nations agreed, as it soon did, that the legal regime of outer space should be based on the principle of freedom. As the number of space vehicles and countries participating in space activities increased, it was only natural for a growing number of states to find the absence of any agreed demarcation line between the two physically adjacent, yet legally quite dissimilar

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[152] AWST (May 7, 1979), 18. Under the terms of an agreement with OTRAG, concluded in 1975, Zaire granted the German company virtually unlimited control over 100,000 square kms of the country's territory. In return, Zaire received a rent and a promise to have a "spy" satellite launched by OTRAG. Forced out of Zaire, OTRAG is reported to have moved its testing activities to Libya (Flight Int'l (Oct. 18, 1980), 1503); AWST (Dec. 1, 1980), 18.

[153] AWST (July 9, 1979), 18.

[154] The question was first formally recognized by the U.N. as a legal problem in the *Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space,* U.N. Doc. A/4141 (July 14, 1959), 25.

areas, a source of "uncertainties in outer space law and in air law."[155] After a decade of inconclusive debate, mainly outside the formal forums, France took the initiative in the late 1960's of placing the problem of the "definition and/or the delimitation of outer space" on the agenda of the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) as a question of some urgency.[156] From the very outset, the two super-powers took the position that such a demarcation line was unnecessary "at the present time" and could even interfere with current and future space activities. Although scientific and technical reasons, as well as the absence of acute legal problems, have regularly been cited in support of this position,[157] the suspicion that military considerations underlie the Soviet-American stand has been growing and appears well founded. It is common knowledge that satellites for surveillance and electronic intelligence which were among the earliest and most important military devices in outer space, operate best in orbits between 100 and 250 miles above the earth. Steady improvements in satellite technology have led to a reduction of the lowest altitude at which spacecraft can survive in orbit. For example, several "close-look" satellites launched in recent years have been able to complete at least one orbit at altitudes of less than one hundred miles.[157a] A boundary at too high an altitude might therefore not only impede existing military programmes but also preclude some future, as yet undefined, low-orbit defence activity.[158]

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[155] *Report of the Legal Sub-Comm. on the Work of its Eighteenth Sess.* (March 12 — April 6, 1979), U.N. Doc. A/AC.105/240 (April 10, 1979), 9.

[156] For a useful survey of the problem of boundaries, including a summary of various proposals made in the COPUOS, see *The Question of the Definition and/or the Delimitation of Outer Space,* U.N. Doc. A/AC.105/C.2/7 Add. 1 (Jan. 21, 1977).

[157] See, *e.g., Report of the Legal Sub-Comm. on the Work of its Nineteenth Sess.* (March 10 — April 3, 1980), U.N. Doc. A/AC.105/271 (April 10, 1980), 8, for a catalogue of various factors advanced by the opponents of a boundary. For a recent commentary see Rosenfeld, *Where Air Space Ends and Outer Space Begins* (1979) 7 J. Space L. 137. According to L. Perek, former Chief of the Outer Space Affairs Div. in the U.N. Secretariat, at least "scientific methods are sufficiently determinate and precise" to suggest a specific demarcation line (*Scientific Criteria for the Delimitation of Outer Space* (1977) 5 J. Space L. 111, 123).

[157a] *E.g.,* certain U.S. high-resolution spacecraft are launched into orbits ranging from 77 to 215 miles and occasionally operate as low as 69 miles above the earth's surface (AWST (Oct. 6, 1980), 18).

[158] Without attribution to any particular country, a recent Report of the Legal Sub-Comm. of COPUOS euphemistically notes that in the view of some delegations an arbitrary boundary "could lead to complications" and "could impede further developments in space science and technology" (*supra,* note 157).

In the spring of 1979, the Soviet Union changed its policy and submitted to the Legal Sub-Committee of COPUOS an informal proposal which suggested that the upper limit of sovereign air space be placed somewhere between 100 and 110 kilometres above sea level.[159] In the same proposal, the Soviets urged the adoption of what amounts to a right of "innocent passage" for spacecraft flying below that altitude. The relevant part of the Soviet proposal reads: "Space objects of States shall retain the right to fly over the territory of other States at altitudes lower than 100 (110) km above sea level for he purpose of reaching orbit or returning to earth in the territory of the launching State."[160] While an international agreement incorporating a low ceiling for sovereign air space with the right of innocent passage might easily have received universal acceptance in earlier years, this may no longer be true. The extension of the arms race to outer space, with military spacecraft of unknown nationality and suspect missions traversing the territory of scores of states at low altitudes, can only arouse apprehension on the part of the subjacent countries. A device like the space shuttle, if used exclusively for civilian missions, would cause little or no concern and would readily be granted the right of innocent passage; but when programmed to carry out, among other functions, manned photo-reconnaissance "to supplement intelligence from unmanned spacecraft",[161] such a grant might not be forthcoming. In sum, whether or not a demarcation line between air space and outer space is necessary at this time is not of principal concern here; what merits emphasis is the likelihood that the military interests of a few powers have delayed for more than twenty years any serious discussion of an issue important to the legal regulation of both air navigation and outer space activities.

C. *Claims to sovereignty over the geostationary orbit*

The rapid and continuing proliferation of communications satellites operating in the geosynchronous equatorial orbit (22,300 miles, or 35,800 kilometers, above the earth's surface) has been a cause of concern for some time to the world community.[162] The

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[159] U.N. Doc. A/AC.105/240, Annex IV (April 10, 1979), 6: *supra*, note 155.

[160] *Ibid.*

[161] AWST (June 4, 1979), 11. For a thoughtful comment on the question of "freedom of passage" for spacecraft, see Goedhuis, *supra*, note 123, 592-3.

[162] See, *e.g.*, Gorove, *The Geostationary Orbit: Issues of Law and Policy* (1979) 73 Am. J. Int'l L. 444; Christol, *The Geostationary Orbital Position as a Natural Resource of the Space Environment* (1979) 26 Netherlands Int'l L. Rev. 5; Corbeil, *Le Statut international juridique de l'orbite géostationnaire* (1978) 32 Revue française de droit aérien 303; Gaviria-Lievano, *Regimen Juridico de la orbita geostacionaria y el espacio ultraterrestre* (1978).

concern stems from the considerable uncertainty as to the number of communications satellites that geostationary orbit can accommodate. While some sources claim that as many as 1,800 satellites could operate simultaneously in that orbit, others place the figure at 180.[163] It is a belief in the accuracy of the lower figure that has led to complaints about "saturation" and "overcrowding" of this limited segment of outer space above the Equator. As of March, 1980, eighty operating satellites have been reported in that orbit, reflecting the steady proliferation of separate communications systems.[164] These systems comprised, by January, 1978, two international, five regional, six military, thirty-four domestic and thirteen experimental systems, as well as five systems for special purposes such as aeronautical, maritime, broadcast and data relay.[165] The number is certain to grow as demand for communications satellite services increases and the technology gets cheaper and thus more accessible to the less affluent countries. The difficulties in accommodating a large number of users in a limited natural resource could be aggravated if plans for stationing massive solar collector satellites in the geosynchronous orbit (to convert solar energy to microwave energy for transmission to earth) should be implemented.[166]

The evolving controversy about slots in the geostationary orbit stems from the shortage of exploitable radio frequencies and the resulting radio interference from operating communications satellites. The International Telecommunication Union, the world regulatory agency, has so far proved unsuccessful in coping with the problem, partly because its regulations on the use of the electromagnetic spectrum are not backed by sanctions, and partly because it does not have the authority to grant or deny positions in the geosynchronous orbit.[167] The opportunities for a fair and rational

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[163] Christol, *supra*, note 162.

[164] N.Y. Times (March 24, 1980), D-1, col. 3. In June, 1978, NORAD reported 108 "vehicles" in geosynchronous orbit, including 30 American and 25 Soviet payloads (N.Y. Times (June 28, 1978), A-15, col. 1). According to some current estimates, by 1990 there will be 239 active satellites in geostationary orbit (Gorove, *supra*, note 162, 445).

[165] Pelton, *Communication Satellite Proliferation: Will We Have Too Much of a Good Thing?* 2 Satellite Communications (Jan. 1978), 22.

[166] See, *e.g.*, Gorove, *Solar Power Satellites and the ITU: Some U.S. Policy Options* (1979) 4 Annals of Air & Space L. 505; Magdelénat, *Energie solaire via satellites et coopération internationale* (1978) 3 Annals of Air & Space L. 467; N.Y. Times (Feb. 20, 1979), C-1, col. 1.

[167] For a useful survey of both the existing I.T.U. regulations and major unresolved issues, see Jasentuliyana, "Regulations Governing Space Telecommunications" in Jasentuliyana & Lee, *supra*, note 39, Vol. 1, 195; Rut-

allocation of positions in this orbit and a just settlement of disputes are further reduced by the provision of the controlling *International Telecommunication Convention* granting virtually unrestricted freedom to military radio installations.[168] While it would be an exaggeration to single out the military as the principal cause of the current crowding of the geostationary orbit, there can be no doubt that their growing presence (amounting to at least twenty *per cent* of all operating communications satellites) materially compounds the problem.[169]

In direct response to these trends, eight equatorial nations, fearful of losing all the available positions in the geostationary orbit to the more advanced countries, asserted a claim on December 3, 1976 to sovereignty over those segments of the orbit which correspond to their national territories.[170] At the same time, they announced that no definition or demarcation of outer space failing to take this claim into account could receive their support. Predictably, the claim ran into strong opposition from the major users of the geostationary orbit. These nations view the orbit as inseparable from the rest of outer space and therefore fully governed

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kowski, *The 1979 World Administrative Radio Conference: The ITU in a Changing World* (1979) 13 Int'l Lawyer 289.

[168] Art. 38(1) of the Convention adopted on Oct. 25, 1973 at Malaga-Torremolinos is quite explicit on this point: "Members retain their entire freedom with regard to military radio installations of their army, naval and air forces" (T.I.A.S. No. 8572). Even when not operating from the geostationary orbit, military satellites are causing interference with civilian uses of the radio spectrum. Thus U.S. Navy surveillance satellites, located in a 700 mile orbit, "have generated protests from some radio astronomers" because they transmit near a band allocated by the I.T.U. to radio astronomy (AWST (July 10, 1978), 23).

[169] For an account of the expanding militarization of this orbit, see *Military communications satellites: a brief overview of current US and Soviet systems* Interavia (April, 1980), 351. The Defence Dep't is the largest user of the radio spectrum in the United States (N.Y. Times (Aug. 30, 1979, D-3, col. 4).

[170] In a statement endorsed by Brazil, Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda and Zaire, these equatorial countries declared that "the geostationary synchronous orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth, and that is why it must not be considered part of outer space. Therefore, the segments of geostationary synchronous orbit are part of the territory over which Equatorial states exercise their national sovereignty": for the text of the "Bogotá Declaration", see Jasentuliyana & Lee, *supra,* note 39, Vol. 2, 383. This claim was originally made by Colombia in the First Comm. of the U.N. Gen. Assembly in Oct. 1975 (U.N. Doc. A/PV. 2376 (Oct. 6, 1975), 42).

by the principle of freedom established in the *Outer Space Treaty*.[171] In that, they enjoy at this time the support of a majority of states. The World Administrative Radio Conference, held late in 1979, which was expected to help resolve the dispute failed even to discuss it. Instead, the participants decided to convene another conference in 1984-85 to deal with the problem.[172]

Although it is likely that a more efficient use of the radio spectrum, capable of accommodating all interests, may be found through future improvements in satellite-communications technology, it could come too late to end the gradual erosion of the principle of freedom which was signalled by the claim of the equatorial states.[173] As history amply demonstrates, it is rare for states willingly to withdraw exclusive territorial claims even when the evidence indicates that their national interest could be better served through a regime of sharing. In retrospect, one wonders if the equatorial states would have advanced their claim to sovereignty over a distant region in outer space if an international agreement on the upper limit of national air space had been in force by 1976.[174] The continuing non-existence of such an agreement seems largely due to the pre-eminence of military considerations in the law-making process for outer space.

D. *Reporting on space activities and satellites in orbit*

Not long after the advent of the space age, an accurate public record of both satellite launchings and satellites in orbit came to be widely regarded as an important factor in the maintenance of public

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[171] The question of the legal status of the geostationary orbit has been on the agenda of COPUOS since 1977. No significant progress in reconciling the opposing views has been made so far: see U.S. Doc. A/AC.105/271 (April 10, 1980), 9.

[172] N.Y. Times (Nov. 17, 1979), 31, col. 1; The Economist (Dec. 8, 1979), 83. For an official summary of the results of the Conference, see I.T.U., *End of the World Administrative Radio Conference, Geneva, 1979*, ITU/79-29 (Dec. 6, 1979).

[173] See, *e.g.*, Goedhuis, *Some Observtaions on the Problem of Definition and/or the Delimitation of Outer Space* (1977) 2 Annals of Air & Space L. 287, 294, where the author expresses a fear for "a gradual dismantling of this principle".

[174] Professor M. Marcoff suggests that these claims should be regarded "as a strong response ... in retaliation for the continuing infringements" of the rights of these states by the space powers (*The International Space Agency Project, the Declaration of Bogota and the "Common Interests" Rule* (1976) 15 Diritto Aereo 166, 181). See also Rosenfeld, *supra*, note 157, 141. Of course, the fact that about 90% of the radio spectrum is now being used by approximately 10% of the most affluent nations almost certainly has influenced the demands of the equatorial states (N.Y. Times (Aug. 30, 1979), D-3, col. 4; N.Y. Times (Sept. 25, 1979), A-1, col. 5).

order in outer space. As early as 1961, the U.N. General Assembly appealed to the launching states to voluntarily furnish the Secretary-General with information on their launchings for purposes of U.N. registration.[175] Nevertheless, it was not until the adoption in 1975 of the *Convention on the Registration of Objects Launched into Outer Space*[176] that the reporting became mandatory for the states party to this agreement (article IV). The *Registration Convention*, though a step in the right direction, unfortunately falls far short of guaranteeing quick, accurate and full reporting of space missions. The requirement of mandatory reporting to the Secretary-General under the Convention is only a slight improvement on the voluntary reporting practised since 1962. Through their domination of the negotiating process in COPUOS, the super-powers made sure that the Convention would allow maximum concealment of their military space activities while preserving the appearance of complete disclosure. Crucial information such as the date and location of the launch, changes in orbital parameters after the launch, and the recovery date of the spacecraft must be reported under the Convention "as soon as practicable".[177] In practice, this may take weeks or months.[178] Incredibly, states are not obliged to reveal the true function of the satellite, information of great and legitimate interest to the world community. All that they must report is the "general function of the space object" (article IV 1(e)). In the apt assessment of a U.S. Senate document, "such descriptions have tended to be so vague as to be close to meaningless."[179] Furthermore, the Convention does not require the launching states to provide each spacecraft and its component parts with appropriate identification markings so as to facilitate the establishment of its country of origin in case of accident.[180] Such markings could prove invaluable, perhaps even indispensable, in determining the state bearing international responsibility for injury or damage caused by a space object.

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[175] U.N. Doc. A/Res. 1721 (XVI) (Dec. 20, 1961).

[176] For the text of the Convention, see sources in note 39, *supra*, For an analysis of the Convention and an evaluation of state practice under the earlier voluntary system of registration, see Senate Committee on Aero. & Space Sciences, 94th Cong., 1st Sess., *Convention on Registration of Objects Launched into Outer Space: An Analysis and Background Data* (1975).

[177] Article IV(1), (3).

[178] Cocca, "Convention on Registration of Objects Launched Into Outer Space" in Jasentuliyana & Lee, *supra*, note 39, Vol. 1, 173, 182; Scoville & Tsipis, *supra*, note 46, 21.

[179] *Supra*, note 176, 22.

[180] Under art. V, marking of space objects is voluntary.

The reporting record of the major space powers under the *Registration Convention* consistently exhibits a lack of candour and minimal concern for the interests of other states. It suffices to recall that no space mission has ever been reported by these powers as serving military purposes. Yet the concealment of the true objective of a particular spacecraft surely cannot be only for the protection of one super-power against the other. Since both possess highly effective monitoring devices, which in most cases can accurately reveal the genuine purpose of a spacecraft, the deception seems aimed at the nations lacking such devices as much as at the potential adversary. The result is the same — growing uncertainty and suspicion as to the nature of all space activities, making future space law agreements more difficult to achieve.

E. *Effects of the space arms race on the human environment*

The universal preoccupation with environmental quality, which in 1972 led to the U.N.'s *Declaration on the Human Environment*[181] and to a series of multilateral treaties aimed at protecting man's habitat from harmful interference,[182] has had insignificant impact on the defence activities of states. New international law, much like the old, turns a blind eye when it comes to restricting military activities, no matter how detrimental they may be to the natural environment. With the sole exception of the *Limited Nuclear Test Ban Treaty*, no other international agreements, not even accords designed to control environmental contamination, apply directly to the armed forces of the contracting parties. In fact, most anti-pollution treaties explicitly exclude the military from their application. A few examples will help illustrate the point.

The world-wide apprehension aroused some two decades ago by the introduction of several nuclear-powered merchant vessels all but terminated experimentation with atomic energy as a civilian marine source of propulsion. Today, the only non-naval vessels using nuclear power are two Soviet icebreakers, operating almost exclusively within the waters adjacent to the U.S.S.R.'s land mass. Paradoxically, more than a dozen nuclear-powered warships and almost two hundred large nuclear submarines on active service in the navies of the four major powers[183] have failed to arouse the same concern. Although many of these instruments of war, armed

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[181] *Supra*, note 135.

[182] For an excellent analytical account of the current state of international environmental law, see Schneider, *World Public Order of the Environment* (1979).

[183] Flight Int'l (April 5, 1980), 1083; Air Force Mag. (Dec., 1980), 66 *et seq.*

with an array of strategic nuclear weapons, are constantly at sea, clearly posing a major threat to oceanic eco-systems, they are for all practical purposes free from public scrutiny or any environmental control other than that unilaterally prescribed by the government which operates them. For example, the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* is not applicable to "those vessels and aircraft entitled to sovereign immunity under international law ..." (article VII(4)).[184] The all-important *International Convention for the Prevention of Pollution from Ships* stipulates that it "shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service ..." (article 3(3)).[185] The U.N.'s draft *Convention on the Law of the Sea,*[186] nearing completion, employs the same language as the *Pollution from Ships Convention* in excluding state vessels from its application. Instead, each contracting state is invited to adopt "appropriate measures not impairing operations or operational capabilities of such vessels or aircraft owned or operated by it, [to ensure] that such vessels or aircraft act in a manner consistent, so far as is reasonable and practicable, with this Convention ..." (article 236). That such a meaningless provision could pass in 1980 for an environmental safeguard provides convincing, as well as alarming, evidence of the growing influence of defence interests in the international law-making process.[187]

The problem of rapidly accumulating nuclear waste offers another example. More than three decades after the atomic age

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[184] Text in (1972) 11 Int'l Leg. Mat. 1294.

[185] Text in (1973) 12 Int'l Leg. Mat. 1319.

[186] U.N., Third Conf. on the Law of the Sea, *Draft Convention on the Law of the Sea (Informal Text),* U.N. Doc. A/Conf. 62/WP.10/Rev. 3 (Sept. 22, 1980).

[187] The absence of any opposition to the accelerating militarization of the world's oceans, inevitably leads to new encroachments. A recent report on a U.S. Navy ocean surveillance system, currently in the process of study and development provides compelling illustration. When completed, the system would consist of hundreds of mobile airborne platforms, covering all the oceans, each equipped with a motor and radar. Stationed 68,000 ft above the surface, each platform would serve the purpose of protecting U.S. warships against missile attacks and would assist in targeting against hostile ships. These platforms would remain aloft for a year (AWST (May 21, 1979), 59). That the deployment of *hundreds* of such platforms in the air space over the high seas would represent a great hazard to the safety of international air and sea commerce and an unprecedented as well as intolerable abuse of the freedom of the sea, has been, apparently, of no concern to the planners of this "defence" system.

began, there is still no solution to the problem of safe disposal of high-level nuclear waste.[188] Some experts believe that the wastes will remain dangerously toxic for millions of years, posing an intolerable threat to future generations. While in this matter the attention of the public and governments has been overwhelmingly focused on the civilian nuclear industry,[189] rarely mentioned is the fact that by far the largest amount of such waste has been generated, not by power plants, but by military activities, primarily weapons production and nuclear submarines.[190] Although the problem of storage is still largely within the exclusive jurisdiction of each operating state, it could soon become a major international concern. This might occur if long-term containment is sought through storage on sites that could threaten resources in which all mankind has a legitimate interest (*e.g.*, on a remote ocean island, in Antarctica, or even in outer space).[191] The legal response of the community of nations to this problem has so far been one of neglect.

The saga of the Franco-British supersonic airliner, the Concorde, provides further evidence of the contrasting treatment routinely accorded by governments and the public to essentially the same technology. The adverse effects of the inevitable sonic "boom", and possibly irreversible damage to the earth's ozone layer expected from the operations of the Concorde, led to a bitter political and legal controversy.[192] When permission for the start of commercial flights was finally given to this aircraft, it was subject to so many restrictions as to make economically sound operations nearly impossible. At the same time, except for low-level flights over densely

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[188] See, *e.g.*, Mathias & O'Neill, *The Nuclear Waste Management Act of 1977* (1977) 19 Atom. Energy L.J. 3 (statute not yet enacted) and Deese, *Sub-Bed Disposal of High-Level Radioactive Waste: Prevention or Management?, ibid.*, 41. See also Sweet, *Unresolved: the front end of nuclear waste disposal* 35 Bull. Atom. Scientists (May, 1979), 44; Flowers, *Nuclear power: a perspective of the risks, benefits and options* 34 Bull. Atom. Scientists (March, 1978), 21; Abbotts, *Radioactive waste: a technical solution?* 34 Bull. Atom. Scientists (March, 1978), 12.

[189] Zinberg, *The public and nuclear waste management* 35 Bull. Atom. Scientists (Jan., 1979), 34; Weisskopf, *The Overwhelming Priority*, 36 Bull. Atom. Scientists (Feb., 1980), 1.

[190] N.Y. Times (Dec. 27, 1979), A-22, col. 1 (editorial); Life (May, 1979), 25.

[191] See, *e.g.*, Time (June 2, 1980), 65, for a proposal to launch nuclear waste in a distant orbit. Deese suggests disposal on sea-bed "in areas beyond national jurisdiction" (*supra*, note 188, 41).

[192] Ross, *The Concorde Compromise: the politics of decision-making* 34 Bull. Atom. Scientists (March, 1978), 46, 50-2. See also *British Airways* v. *Port Authority of New York* 564 F. 2d 1002 (1977). The genesis of the Concorde and its environmental effects are explored in Wilson, *The Concorde Fiasco* (1973).

populated areas, literally thousands of military supersonic aircraft were free to operate at all altitudes, over land and sea, with only token concern for the environment. The environmental impact of these aircraft has so far failed to stir the world community into action; hence international law contains no specific rules for the protection of the atmosphere and the earth's ozone layer against this hazard.[193]

Probably because man's activities in outer space are relatively new, and are predominantly military in nature, and are carried on in a seemingly boundless area, their environmental impact has received to date only scant attention by states. Yet sufficient experience is available to show that these activities can cause harmful effects both on earth as well as in outer space.[194] Congestion ("crowding") of the near-earth space, falling debris, damage to the atmosphere and ionosphere (including the ozone layer) by rocket propellants and the danger of radioactive contamination are only the most obvious risks posed by the growing utilization of outer space. The word "congestion" when applied to this infinite environment seems almost absurd, and this would be the case if the present and foreseeable uses of space were evenly spread throughout our solar system. But the largest number of satellites, including all those of the greatest practical utility, are operating in the vicinity of the earth. Congestion is beginning to be felt at and below the geostationary orbit, especially in the region extending to an altitude of 1,000 miles. In 1979, 6,811 man-made objects had been identified in that region, including hundreds of operating satellites as well as fragments of decayed spacecraft.[195] By 1985, the number of orbital objects may double.[196] In the not too distant future, a large assembly of orbital stations in outer space can be expected, with constant shuttling of supply spacecraft to and from the earth, further adding

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[193] See Schneider, *supra*, note 182, 41. See also Christol, *Aircraft and the International Legal and Institutional Aspects of the Stratospheric Ozone Problem* (1976) 1 Annals of Air & Space L. 3.

According to the U.S. National Academy of Sciences, the earth's ozone layer is being depleted at twice the rate predicted earlier (N.Y. Times (Nov. 10, 1979), 21, col. 5). See also *The Global 2000 Report*, Statement by the Secretary of State, 80 Dep't State Bull. (Sept., 1980), 38, 40. In a period between 1968 and 1977, the number of nations operating supersonic combat aircraft rose from four to forty-seven (Flight Int'l (Oct. 27, 1979), 1339).

[194] Christol, *Protection of Space from Environmental Harms* (1979) 4 Annals of Air & Space L. 433; Sand, *Space Programs and International Environmental Protection* (1972) 21 Int'l & Comp. L.Q. 49.

[195] N.Y. Times (July 11, 1979), A-18, col. 1.

[196] Time (March 24, 1980), 45.

to the density of traffic.[197] It should come as no surprise that most of the crowding is being caused by the military who, according to an authoritative source, account for seventy-five *per cent* of all satellites launched to date, of which fifty *per cent* are of the surveillance type.[198] A large concentration of man-made objects in near-earth orbits aggravates security problems owing to a lack of fully reliable identification methods, creates possibilities of collision, causes interference with the radio signals used by various civilian space missions (*e.g.*, radio astronomy and telecommunications) and increases the danger of injury and damage on the earth from fragments of decaying space vehicles.

Because, after twenty-three years of space activities, no appreciable damage has been caused on the earth from falling debris, governments have felt no sense of urgency to adopt a code of conduct aimed at minimizing and preventing the harmful consequences of such activities. The *Convention on International Liability for Damage Caused by Space Objects,* (1972), while noting that "notwithstanding precautionary measures to be taken by States and international inter-governmental organizations involved in the launching of space objects, damage may on occasion be caused by such objects", nevertheless becomes operative only *after* a damage-causing accident.[199] The indifference to this potential threat to life and property received a severe jolt on January 24, 1978, when, with a minimum of warning, a five-ton Soviet surveillance satellite (Cosmos-954), with a small nuclear reactor aboard, disintegrated over Canada's Arctic. After a lengthy search, a number of the satellite's fragments were recovered, with several of them found to be of "lethal radioactivity". The cost of search and clean-up operations amounted to $14,000,000.[200] This incident served to draw the world's attention to the longstanding practice of space powers in launching

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[197] The U.S.S.R. is reportedly planning to launch into earth orbit a 220,000 pound "military-scientific" space station, with a crew of twelve cosmonauts, by mid-1980's (AWST (June 16, 1980), 26).

[198] Lay, *Nuclear technology in outer space* 35 Bull. Atom. Scientists (Sept., 1979), 27, citing SIPRI's *World Armaments and Disarmament Yearbook* (1978).

[199] Preamble: the Convention was opened for signature on March 29, 1972 (text in Jasentuliyana & Lee, *supra,* note 39, Vol. 2, 13).

[200] A comprehensive account of the incident and the search for debris appears in Heaps, *Operation Morning Light* (1978). For Canada's claim against the U.S.S.R. for damage caused by the Soviet satellite, see (1979) 18 Int'l Leg. Mat. 899; see also Farand, *L'apport du Canada en matière de responsabilité internationale pour les dommages d'origine spatiale: l'affaire du satellite Cosmos 954* (1980) 11 Etudes Internationales 467. Under the terms of a tentative agreement, the U.S.S.R. will pay Canada $3 million in damages (The [Montreal] Gazette (Nov. 22, 1980), 11, col. 5).

into outer space, without any international controls, vehicles carrying radioactive materials. Since the practice started, between twenty-five and one hundred satellites equipped with nuclear power sources have been placed by the U.S.S.R. and U.S. in earth orbit or used for lunar and planetary exploration.[201] Following the fall of Cosmos-954, Canada called for a review of existing international legal texts, in the light of the special hazards posed by the use of nuclear power sources in space. In particular, the Canadian government felt that "serious questions arise as to the adequacy" of the *Registration Convention* in controlling space objects carrying hazardous substances which "pose serious risks to human life and to the earth's environment". To reduce these hazards, it suggested the elaboration of "more stringent notification requirements at each of four stages in the life of such satellites"[202] (the four stages being its initial launching, its decaying orbit, the period immediately prior to impact, and the post-impact period). In response to the Canadian request, the "[q]uestion relating to the uses of nuclear power sources in outer space" was placed on the agenda of COPUOS in 1978 as a priority item.[203] The subject is still being discussed and no specific action has so far been taken.[204]

It should be emphasized that Canada is not urging a total ban on the placing of radioactive materials in outer space; it merely seeks improved international control in the use of such materials and better notification procedures with regard to vehicles carrying radioactive substances.[205] The modest scope of these recommendations may well be dictated by the opposition of both space powers to the idea of a complete prohibition on nuclear devices in outer space.[206] Yet it would seem reasonable, however, to expect a total

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[201] Jasentuliyana, *A Perspective of the Use of Nuclear Power Sources in Outer Space* (1979) 4 Annals of Air & Space L. 519, 521; Lay, *supra*, note 198.

[202] Statement by Ambassador R. Harry Jay to the Legal Sub-Comm. of COPUOS, Geneva (March 14, 1978), 4 (mimeograph).

[203] Endorsed by the Gen. Assembly, in U.N. Doc. A/Res./33/16 (Nov. 10, 1978).

[204] On recommendation of the Gen. Assembly (U.N. Doc. A/Res./34/66 (Dec. 14, 1979)), the Legal Sub-Comm. of COPUOS commenced in the spring of 1980 an examination of existing international law in order to ascertain its adequacy to control the use of nuclear power sources in outer space. Early debates revealed that some states believe that existing principles and norms of international law "quite adequately and sufficiently regulated all aspects of the use of nuclear power sources in outer space" whereas others, including Canada, felt that new, more specific, international rules were necessary: see U.N. Doc. A/AC.105/271 (April 10, 1980), 10-3.

[205] See Canada's working paper on the "Use of Nuclear Power Sources in Outer Space", *ibid.*, Annex III.

[206] See, *e.g.*, Lay, *supra*, note 198.

ban at least to be discussed since even the most ardent advocates of nuclear energy concede that it is virtually impossible to eliminate all the risks that this form of energy poses.[207] Moreover, once nuclear materials have been introduced into outer space, even in their present limited quantities, the process may become irreversible, with additional and more lethal devices following.[208]

Only a year and a half after the Cosmos incident, the world had another opportunity to witness the inability of a leading space power to control the movement of one of its most advanced spacecraft. On July 11, 1979, the U.S. "Skylab", a space giant weighing seventy-seven tons and for some time out of control and losing orbital altitude, began to disintegrate upon re-entering the earth's atmosphere.[209] Its fragments fell into the Indian Ocean and on sparsely populated Western Australia with the heaviest part found to weigh eighty kilograms. No injury or damage was reported. Fortunately, the spacecraft's disintegration began at a relatively low altitude of ten miles, resulting in an area of debris distribution much smaller than expected — about forty miles wide and 2,400 miles long, compared to the anticipated one hundred by 4,000 miles.[210]

The adverse effects on the terrestrial and space environment produced by rocket exhaust fumes are self-evident. While the amount of pollutants introduced into the biosphere in the course of normal launchings is significant, it increases greatly in the case of an aborted flight, when hundreds of thousands of pounds of toxic propellants are released in the earth's atmosphere. Although the hazards of atmospheric contamination by space activities have been known for a long time, the only international organization studying the problem with any regularity is the Committee on Space Research (COSPAR), a non-governmental scientific organization with no decision-making authority over states. In one of its

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[207] Jasentuliyana, *supra*, note 201, 525.

[208] The risks arising from the nuclear satellites and the steady expansion of military activities in outer space have led one observer to urge "demilitarization and denuclearization of at least low earth orbits" (Mateesco-Matte, *Cosmos 954: Pour une "Zone orbitale de sécurité"* (1978) 3 Annals of Air & Space L. 483, 508).

[209] N.Y. Times (July 12, 1979), A-1, col. 5.

[210] NASA News Release No. 79-151 (Nov. 14, 1979). The U.S. civilian space progamme experienced in Dec. 1979 another mishap, of a most bizarre nature. A $50 million R.C.A. communications satellite, launched on Dec. 6 from Cape Canaveral, "disappeared" without trace as it went into orbit. All attempts to locate this one-ton spacecraft have remained unavailing (N.Y. Times (Dec. 12, 1979), D-22, col. 1; N.Y. Times (Jan. 20, 1980), 37, col. 1).

resolutions adopted in 1979, COSPAR repeated its warning about the "unwarranted effects [of satellites] during atmospheric re-entry" but could do no more than urge the launching states "to be cognizant of these effects and to make appropriate provisions to have such debris impact in areas where no damage to human activity is expected."[211] This appeal, like the earlier ones,[212] has not yet generated any noticeable response from governments.

Twenty-three years since the advent of space activities, the legal protection of the earth-space environment against harmful uses still rests largely on a single article (article IX) of the *Outer Space Treaty*. The relevant part of article IX states:

> In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty ... shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, could cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.

As far as is known, the consultations provided for in this article have been neither requested nor held. Similarly, though the need for an impartial standard-setting international authority with a final decision-making power to which all experiments and programmes potentially harmful to the earth-space environment would have to be reported for advance clearance, has long been recognized if

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[211] Resolution adopted by the Executive Council and the XXII Plenary Meeting of COSPAR, Bangalore, India, June 9, 1979: COSPAR Info. Bull. No. 85 (Aug., 1979), 21.

[212] In 1976, for example, Professor C. de Jager, President of COSPAR, in an address to COPUOS warned that with the increased number of launchings of large spacecraft "the danger of polluting the upper atmosphere and outer space is becoming greater than previously" and promised appropriate action on the part of COSPAR (COSPAR Info. Bull. No. 77 (Dec., 1976), 12, 17).

outer space is to be used responsibly and for the benefit of all mankind, the establishment of such or a comparable organ has never been seriously discussed in the forums of the United Nations. Thus, while years of labour by the member states of the United Nations produced, in 1979, a detailed code of regulations on the management of resources on celestial bodies[213] (an activity not contemplated in the foreseeable future by any state), the conduct of environmentally hazardous space activities continues to be governed by the rudimentary clauses of the *Outer Space Treaty*, even after the launching of some 2,000 satellites. Various reasons could be advanced to explain the lack of a governmental initiative on these issues of global concern. Given, however, the volume of defence space programmes and the influence of the space powers on the world law-making process, it is by no means inconceivable that the "defence" interests of these powers bear the principal responsibility for inaction.

V. The partial demilitarization of outer space: a step towards the preservation of international order?

Efforts to contain the widening militarization of outer space, as the above survey shows, have so far produced meagre results. Since the adoption of the Treaty of 1967, banning the stationing of nuclear and other weapons of mass destruction in outer space, no other measure of military restraint has been added to the body of international space law. The half-hearted attempt, initiated in 1978 by the United States and the Soviet Union, to prevent the deployment of anti-satellite weapons has been abandoned, at least temporarily, after three meetings. Judging by the results, these meetings apparently served no other purpose than to accentuate the differences between the parties. Meanwhile, both countries seem to have been proceeding with the development of satellite destroyers, the United States planning to test its weapon against targets in outer space by 1981 or 1982. On the broader, strategic plane, the SALT II agreement was signed in June, 1979 by the leaders of the two super-powers after seven years of negotiations. It failed to win the advice and consent of the U.S. Senate and, on the orders of President Carter, was withdrawn from the Senate in January,

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[213] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, U.N. Doc. A/Res./34/68 (Dec. 14, 1979). For a historical perspective and analysis of the treaty, prepared by E. Galloway, see U.S. Senate Comm. on Commerce, Science and Transportation, *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 96th Cong., 2d Sess. (Comm. Print, 1989).

1980 for an indefinite period of time.[214] Further strategic-arms limitation negotiations, which were expected to follow the ratification of SALT II and lead to a SALT III agreement, have yet to begin.

The 1978 U.N. Special Session on Disarmament, in its comprehensive Program of Action,[215] quite properly assigned the highest priority in disarmament negotiations to nuclear and other weapons of mass destruction, conventional weapons and a reduction in the armed forces. Among its many specific recommendations, the Program of Action contains only one (no. 80) which is addressed specifically to the arms race in space. Although the process of militarization of space was by 1978 well under way, the Program of Action seems oblivious to that fact, for it appeals to states to "prevent an arms race in outer space" by taking unspecified "further measures" and by holding "appropriate international negotiations ... in accordance with the spirit" of the *Outer Space Treaty*.[216] Even if nations to whom this appeal was primarily addressed were ready to undertake such negotiations, the ambiguity of this recommendation would allow them to pick and choose at will the subject-matter of the negotiations. Moreover, if past experience is a reliable guide, space powers will likely opt for bilateral negotiations which might eventually lead to the banning of a space system of marginal significance or one which is for the moment unproductive in cost-benefit terms.

Among the participating states, only France chose outer space as the centre-piece of its contribution to the goals of arms control and disarmament. On the premise that supervision is "crucial to disarmament", President Giscard d'Estaing proposed the establishment of an international "satellite monitoring agency" to serve the security needs of the world community.[217] In a memorandum submitted on 30 May 1978 to the U.N. Secretariat, France provided a more detailed outline of the functions of the proposed agency.[218]

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[214] See *supra*, note 19. In view of this record, it is hard not to agree with the observation by Professor Hedley Bull of Oxford University that "[t]he behaviour of the United States and the Soviet Union in the late 1970's and 1980's suggests that they may be forfeiting the claims they had begun to build up in the 1960's and early 1970's to be regarded by others as responsible managers of the affairs of international society as a whole" ((1980) 35 Int'l J. 437).

[215] *Final Document of the Tenth Special Session of the General Assembly*, *supra*, note 23, 11.

[216] *Ibid.*, 17.

[217] U.N. Doc. A/S-10/PV.3 (May 25, 1978), 16.

[218] U.N. Doc. A/S-10/AC.1/7 (June 1, 1978).

The purpose of the agency would be to monitor compliance with disarmament and arms-control agreements, whether already in force or yet to be concluded, and to assist in the investigation of situations endangering the maintenance of peace. Integrated into the United Nations system, the new organization is expected to help "strengthen international confidence and security".

The implementation of the French proposal could indeed make a meaningful contribution to the cause of international security, and particularly to the security of minor powers. Unfortunately, it would be unlikely in the foreseeable future to have any tangible effect on the arming of outer space. What it might achieve in the short run is prevention of any increase in the number of states with military hardware in outer space. In the long run, it could serve as the nucleus of a future global organization designed to monitor all aspects of disarmament and arms-control agreements in force among states. Commendable as the French initiative is, neither it nor any of the numerous recommendations contained in the Program of Action have so far resulted in a single significant measure of arms restraint, not even on issues such as the comprehensive nuclear test ban, where agreement has been within reach for years. As though in the theatre of the absurd, the tempo of the arms competition has in fact significantly accelerated, with vast new appropriations for the development and deployment of ever more destabilizing strategic and conventional weapon systems. No government of a major power has shown the slightest intention of implementing the policy of "suffocation" of the arms race, not even Canada, whose Prime Minister, Pierre Elliott Trudeau, recommended this policy to the U.N. Special Session on Disarmament.[219]

Technical obstacles (*e.g.*, verification), strategic imperatives and "asymmetries" between competing forces have usually been cited as factors delaying arms-control agreements. These are doubtless weighty considerations whose significance must not be underrated. However, as the negotiating history of disarmament amply shows, at the same time as they have been trying to resolve these difficulties, negotiating parties have invariably continued to develop new classes of weapons systems, often more destabilizing than the ones being negotiated. For example, it is widely believed that a com-

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[219] *Supra*, note 25, 6. Mr Trudeau's "strategy of suffocation" contemplates a combination of four separate measures: (1) a comprehensive test ban; (2) an agreement to end the flight-testing of all new strategic delivery vehicles; (3) an agreement to prohibit all production of fissionable material for weapons purposes; (4) an agreement to limit and then progressively to reduce spending on new strategic weapons systems.

prehensive test ban achieved in the 1960's would have prevented the development of MIRV's and, quite possibly, would have arrested the further proliferation of nuclear-weapons states. The result has been a vicious circle: new "asymmetries" come into being, creating more, rather than less, complex problems in future negotiations and augmenting uncertainties without any corresponding improvement in the security of the states concerned.[220] The process has been aptly described as "the apotheosis of irrationality and anti-logic — the triumph of madness".[221]

The addition of outer space technology to an already super-complex defence arsenal presages a new order of difficulties for arms-control negotiations. As noted earlier, partly through the absence of specific legal prohibitions and partly through a self-serving interpretation of the *Outer Space Treaty*, the super-powers have succeeeded in transforming outer space into an arena where military interests dominate all other interests. This situation finds no parallel in any other environment accessible to man. That these conditions have been allowed to develop in little more than two decades is, however, not due exclusively to the pressures of the great powers; governments of other states must also share a large degree of responsibility for having failed to demand, once the trend became apparent, compliance by the Soviet Union and the United States with the 1967 Treaty that these two nations were instrumental in drafting.[222] A continuation of the policy of acquiescence not only endangers the legitimate interests of all states in the peaceful

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[220] As one analyst notes, the "pace of weapons innovation outstrips the negotiating process, so agreements about one weapons system are made obsolete by the emergence of new ones.... Thus the more frantic the pace of research and development, the more difficult it becomes to reach arms control agreements" (Frank, *When Fears Take Over* 35 Bull. Atom. Scientists (April, 1979), 24, 26). Very soon, for purposes of arms control, the super-powers will have to take into account the capabilities of other nations. And, the "multiparty arms control negotiations will be much more difficult because of the increased number of asymmetries which will be involved" (Stukel, *Technology and Arms Control* (1978), 19).

[221] Weisskopf, *A peril and a hope* 35 Bull. Atom. Scientists (Jan., 1979), 10, 12.

[222] One should hope that a growing number of governments will follow Ambassador Alva Myrdal's (for many years chief Swedish delegate to the disarmament negotiations) pertinent recommendations: "When the super-powers stall all arms negotiations, the other nations must countermand the drift toward general hopelessness ... . These nations should have insisted upon being heard before decisions were taken to introduce new weapon systems, which multiply the threats: ... it is necessary to demonstrate the conviction that the superpowers have no right to stall all disarmament negotiations in the absence of a finalization of SALT II" (*Europe as hostage of the superpowers?* 36 Bull. Atom. Scientists (April, 1980), 4, 5).

exploitation of this environment, but also makes the prospects of restoring the domain of space to the status of the "province of all mankind", as originally intended, much more uncertain.

From playing a strictly supportive role in the overall arms competition, defence space technology has in recent years been undergoing a highly alarming qualitative change. It is rapidly becoming an integral, possibly essential, segment of the earth-based strategic offensive and defensive weapons systems, perhaps even a key element in the development of the so-called "pre-emptive" capability. The ASAT weapons, a logical progression in this trend, will soon create the risks of "secret" warfare in outer space which could easily spread to the terrestrial environment. Removing these very real threats to world peace and preserving outer space for uses beneficial to all states will require prompt, concerted and determined action. A debate among states on all the current military uses of outer space, with special attention to those most adverse to international security, is long overdue.[223] Space systems which have proven their potential usefulness to the maintenance of peace (such as surveillance and missile-detection satellites), or which are already fully integrated into the defence arsenals of the major powers (such as communications satellites), should be explicitly accorded legitimacy.[224] Others, whether offensive (such as ASAT weapons) or highly destabilizing, in that they threaten the strategic deterrent of the adversary (such as satellite-based "global positioning system"), should be proscribed. Admittedly, this would amount to a demand for a significant measure of arms control and even a degree of disarmament. But the initiative has to be taken somewhere and outer space, for legal and practical reasons, seems to provide the most promising opportunity. In contrast with other regions where nations traditionally carry on the arms race, the legal regime of outer space, like that of Antarctica, is designed to preserve the use of this environment for "peaceful purposes" and for the "benefit and in the interests of all countries". Whatever meaning one may give these words, and regardless of the absence of an explicit ban

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[223] Some states, including Italy and Sweden, have recently urged, in the United Nations, early examination of measures to prevent an arms race in outer space: see, *e.g.*, U.N. Doc. A/AC.105/PV.205 (June 24, 1980), 27.

[224] Formal recognition that reconnaissance from space is lawful would merely reflect the common interest of *all* states in the maintenance of international stability and in avoidance of potentially catastrophic miscalculations. Effective mutual deterrence "depends upon the major participants' adequate knowledge of their respective capabilities and intentions" (Colby, *The Developing International Law on Gathering and Sharing Securtiy Intelligence* 1 (1974) Yale Studies in World Public Order 49).

on all military uses in the Treaty of 1967, there can be no doubt that the present and projected military space activities are contrary to the letter and spirit of the Treaty. On the practical side, it appears that neither the anti-satellite weapon nor the global positioning satellite system have attained, or will soon attain, full operational status. Eliminating these devices, even without a more comprehensive arms-control agreement, would not jeopardize the security of either power.[225] It may be recalled in this connection that the 1972 bilateral Treaty on the limitation of anti-ballistic missile systems, a comparable measure of restraint, has not upset the strategic balance between the United States and the Soviet Union in the slightest. If there are some risks in the suggested course of action for one or the other party, the risks are far greater for them and for the world community if no action is taken at all.

International jurists have a special moral and professional obligation to assist in the process of the gradual demilitarization of all environments, including that of outer space, for if the present trends are allowed to continue, there will soon remain no scope for law in the relations among states. So far, as a group, they have failed to recognize adequately and respond to the dramatic decline in the influence of international law on the conduct of governments. Even a cursory examination of events since the adoption of the U.N. Charter, especially of the last decade, reveals the increasing frequency of serious violations of international legal norms, a phenomenon without precedent in this century. Acts of aggression, unlawful interference in the internal affairs of sovereign states, spreading transnational terrorism, the illegal occupation of foreign territories, attacks on diplomatic missions and assassinations of diplomats, brutal violations of the international law of human rights, increasingly virulent economic and ideological warfare, routine violations of international treaties and United Nations

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[225] In their "history" of the global war to come, General Sir John Hackett and other top-ranking NATO officers and advisers note that even in 1985 military space systems were largely "extensions of existing earth-based facilities ... and therefore never wholly indispensable." Only electronic reconnaissance satellites were of "critical interest" to NATO, according to Hackett and his collaborators (*The Third World War: August 1985* (1979), 254). An American group of experts has recommended as the immediate goal of arms control in outer space "putting a ceiling on current space weapons, as well as attempting to restrict the deployment of new weapons systems in outer space." In their view, negotiations should start with the true ASAT systems before dealing with the U.S. space shuttle and Soviet Salyut: see Stanley Foundation, *Nineteenth Strategy for Peace Conference Report* (1978), 22.

declarations (particularly those concerning the maintenance of peace), the continuing, perhaps even increasing, reluctance of states to use pacific means, including the services of the International Court of Justice, for the settlement of their disputes — all these suggest the most serious crisis modern international law has ever faced in circumstances short of world war. The fact that this pattern of conduct is taking place in the midst of a spiralling arms race, in which not only major powers but also a growing number of developing nations partake, contributes to and reflects the erosion of respect for international law.

The response of a majority of international jurists to these overriding challenges, especially to the problems of a virtually unrestricted arms build-up, has been largely one of silence. It would seem that many of them have been persuaded by the national security bureaucracies that issues of war and peace are somehow beyond the competence and of no legitimate concern to international lawyers. Their largely self-imposed abstinence may account for the minimal influence of international law on the decision-making process in the higher councils of most states.[226] A dramatic change in this attitude of indifference and helplessness is imperative if international law is to overcome its present crisis. While one cannot expect our contemporary society to produce a jurist of Grotius's influence, no government could long afford to ignore the voice of many thousands of jurists of all nationalities, speaking, writing

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[226] Neither their influence nor the cause of peace will be enhanced by contributions such as a recent one by Roger Fisher, Professor of International Law at Harvard. Apparently, accepting Gen. Hackett's prophecy of the inevitability of war between the two power blocs (*supra*, note 225), Fisher is preoccupied with the drafting of a cease-fire agreement, which he thinks might follow the outbreak of hostilities and the employment of nuclear weapons. With unsurpassed Orwellian logic, Prof. Fisher asserts that "[n]othing would contribute more to our survival than figuring out what to do should such a war break out" (*Thinking About War* N.Y. Times (May 7, 1980), A-31, col. 5). Instead of promoting the apocalyptic cravings of Gen. Hackett & Co., Prof. Fisher would better serve the cause of "our survival" and of world public order by constructing his scenarios on one of the last public statements (largely ignored by the mass media) of the late Earl Mountbatten, former chief of the British Defence Staff. On May 11, 1979, giving his views on nuclear weapons, both "tactical" and "strategic", he stated: "as a military man I can see no use for any nuclear weapons which would not end in escalation, with consequences that no one can conceive. ...The nuclear arms race has no military purpose.... There are powerful voices around the World who still give credence to the old Roman precept — if you desire peace, prepare for war. This is absolute nuclear nonsense" (35 Bull. Atom. Scientists (Oct., 1979), 1).

and, if in government service, acting in defence of the international legal order. This potentially powerful constituency could materially assist the movement away from the growing militarization of world society and the dominance of national as well as international political and legal processes by militaristic values. The space environment, formally declared to be the "province of all mankind", seems to offer the best opportunities for beginning a trend towards meaningful arms-control measures that eventually might lead to a genuine disarmament. If no progress can be made in this area, then there is no realistic hope for the cause of arms control and disarmament at all.*

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*After this article went to press, the author received the official record of the meetings held in Oct., 1980 by the Special Political Committee of the U.N. General Assembly. The record reveals a significant change of attitude among states towards the galloping militarization of outer space. After years of watching the arming of outer space by the two super-powers with tacit disapproval, many nations have now decided to express formally their objections and to seek urgent and effective measures against further abuses of the *Outer Space Treaty*. Representatives of Argentina, Austria, Brazil, Chile, Ecuador, Egypt, India, Italy, the Netherlands, Pakistan, Philippines, Romania, Sierra Leone, Sweden, Tunisia, Upper Volta and Yugoslavia — all voiced their deep concern about the future of outer space as a peaceful environment if the current process of militarization is not arrested. Particularly strong and explicit were the statements made by the representatives of India and Brazil. The representative of India said, *inter alia*: "No military activities should be introduced into space programmes on any pretext" (U.N. Doc. GAOR A/SPC/35/SR.17, 17 (Oct. 28, 1980)). The representative of Brazil: "In accordance with the 1967 Treaty, outer space should be preserved as an environment free from military operations and any breach of that basic rule of international law [is] inadmissible" (U.N. Doc. GAOR A/SPC/35/SR. 15, 8 (Oct. 24, 1980)).