The Non-Weaponization of Outer Space

Lucy Stojak

Prepared for the

International Security Research and Outreach Programme
International Security Bureau

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EXECUTIVE SUMMARY

This report provides an overview of the nature and work to date on international instruments concerning the non-weaponization of outer space, together with analysis of hurdles encountered.

The report provides an assessment of the efficacy for negotiating a convention banning space weapons through negotiation within the Conference on Disarmament, through negotiation of amendments or protocols to the outer space treaty, or through stand-alone negotiations unconnected to existing agreements or fora.

RÉSUMÉ

Le présent rapport fournit un résumé de la nature et du travail, à ce jour, des instruments internationaux relatif à la non-arsenalisation de l'espace extra-atmosphérique, ainsi qu'une analyse des obstacles rencontrés.

Ce rapport évalue aussi la pertinence de négocier une convention bannissant les armes dans l'espace à travers les travaux de la Conférence sur le désarmement (CD), à travers des négociations pour amender le protocole sur le Traité sur l'espace extra-atmosphérique et à travers des négociations indépendantes non reliées à des accords ou des forums multilatéraux existants.

PREFACE

The International Security Research and Outreach Programme (ISROP) commissioned a study on the non-weaponization of outer space. This report stemmed from that study.

The Department of Foreign Affairs and International Trade wishes to acknowledge the work performed under contract through ISROP by the author: Dr. Lucy Stojak.

The view expressed in this paper are those of the author, and do not necessarily reflect the views or positions of the Department of Foreign Affairs and International Trade or the Government of Canada.

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BRIEF OVERVIEW OF LAW REGULATING MILITARY ACTIVITIES IN OUTER SPACE

The United Nations (UN) Charter 1945[1]

The applicability of the UN Charter to outer space is affirmed by Article III of the Outer Space Treaty [2], which calls upon states parties to the Treaty to carry out activities in the exploration and use of outer space "in accordance with international law, including the Charter of the United Nations".

Article 2(4) of the Charter states that all members shall refrain from the "threat or use of force". Whether this blanket prohibition of force or threat of force implies that any plans to introduce weapons into outer space would in itself be considered a threat of force, and whether it also prohibits the deployment of weapons directed from space to targets on earth are open questions.

Article 51 of the Charter recognizes the inherent right to individual or collective self-defense "if an armed attack occurs". In the view of some authorities, Article 51 limits the exercise of the right of self-defense to situations where "armed attacks" have occurred, rather than against those which may be in the making, that is "anticipatory self defense". [3]

Partial Test Ban (PTB)Treaty, 1963[4]

Chronologically speaking, the PTB Treaty of 1963 is the first international legal regulation of a military use of outer space. The Treaty was elaborated between 1958 and 1962, with negotiations eventually being conducted in the Eighteen Nation Disarmament Committee (ENDC). Lack of progress in this forum led to private negotiations which resulted in the Treaty.

Article I stipulates that each state party undertakes "not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control: (a) in the atmosphere; beyond its limits, including outer space; or underwater, including territorial waters or high seas…". An argument could even be made that subsequent state practice (i.e. restraint from conducting atmospheric tests) has transformed this obligation into a rule of customary international law.

The treaty establishes several significant implications for space. First, while the treaty prohibits all nuclear detonations in space, even those that may have value for military or scientific purposes, it does not regulate detonations of a non-nuclear nature such as those pertaining to conventional, biological, chemical or high energy laser weapons. Second, because the treaty prohibits "any nuclear weapon test explosion, *or any other nuclear explosion*" [emphasis added]

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[1] Can.T.S. No.7. Opened for signature 26 June 1945; entered into force 24 October 1945.
[2] See this Chapter 1, p. 13.
[3] See Kittrie, N.N., "Aggressive Uses of Space Vehicles-The Remedies in International Law" in, Proceedings of the 4th Colloquium of the International Institute of Space Law of the International Astronautical Federation, 1960, 198, at 204. (Hereinafter cited as the IISL Coll.); De Saussure, H. & Reed, W.D., "Self-Defense – A Right in Outer Space", 7 A.F.J.A.G. Rev.40 (1965).
[4] The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, 480 U.N.T.S. 43. Opened for signature 5 August 1963; entered into force 10 October 1963.

it may prohibit the use of nuclear fission as a means of space propulsion. To the extent that nuclear power sources operate by means other than "explosion" the Treaty does not prohibit their use. Finally, the Treaty also prohibits the use of nuclear explosions for non-testing purposes as well. Thus, for example though the creation of an electromagnetic pulse in space by means of a nuclear detonation may present strategic military advantage, particularly in an anti-satellite role, such an activity is forbidden by the Treaty.

The PTB Treaty does not contain any verification provisions but it may be assumed that it would be relatively simple to determine if a breach had occurred although it might be more problematic to determine the manner in which it occurred and the identity of the offending party.

Anti-Ballistic Missile (ABM) Treaty 1972[5] and Protocol 1974[6]

The ABM Treaty limits the deployment, testing, and use of missile systems designed to intercept incoming strategic ballistic missiles. At the time of its adoption, the Soviet Union and the US believed that the best way to avert the possibility of a nuclear exchange was to render each side defenseless to a nuclear attack. Thus, with one exception, both parties agreed to prohibit the testing, development, deployment and use of ABM systems. The exception allows each side to maintain one ABM system either around its national capital, or an ICBM site. The treaty originally allowed two ABM systems having a radius of 150km or less. This was reduced to one by protocol of 1974.

Article V (1) provides that "[e]ach party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based." This provision still permits development, testing and deployment of fixed land-based systems, albeit limited to certain geographical areas in continental US and former USSR. Research is permitted by the Treaty.

Article II defines an ABM system as a system to counter strategic ballistic missiles or their elements in flight trajectory and lists the components of an ABM missile system. The parties also agreed, in Statement D, that in the event ABM systems "based on other physical principles including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars" were created, specific limitations on such systems and their components would be subject to discussion. At the time the agreement was reached the term "other physical principles was generally understood to encompass lasers, infrared sensors and particle beam technology. Despite past attempts to "broadly interpret" the ABM Treaty, the weight of legal opinion is that Agreed Statement D does not provide a loophole for testing such advanced ABM systems in space.[7]

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[5] Treaty Between the USA and the USSR on the Limitation of Anti-Ballistic Missile Systems. Treaties and other International Acts, Series 7503, (Washington: US Department of State, 1973). Signed on 26 May 1972; entered into force on 3 October 1972.

[6] See Protocol to the Treaty between the USA and the USSR on the Limitation of Anti-Ballistic Missile Systems, 27 U.S.T. 1645, T.I.A.S. 8276. Opened for signature 3 July 1974; entered into force 24 May 1976. The Protocol specified that the US would not deploy an ABM system in the area centered on its capital, while the Soviet Union would not deploy an ABM system in the deployment area of its ICBM silo launchers.

[7] For a detailed discussion on this issue, see Chayes, A. and Chayes, A.H., "Testing , (June 1986), pp. 1956-71and Development of 'Exotic' Systems under the ABM Treaty: The Great Reinterpretation Caper," 99 Harvard Law Review 1576 (1986).

The ABM Treaty contains no definition of the term "space-based". Furthermore, no definition or delimitation of the term "space" is contained in any other international agreement.[8] However, it is generally understood that an object in Earth orbit is in outer space.[9] The term "based" is more easily defined. Its ordinary meaning includes *inter alia* a starting point. The scope of the term "space-based" should therefore be confined to BMD components which are placed in Earth orbit.[10]

Verification of treaty compliance is to be provided by the use of "national technical means"… in a manner consistent with generally recognized principles of international law (Article XII). National technical means (NTMs) include *inter alia* satellites, aircraft, and ground systems. With this provision, not only was the legality of space-based surveillance by means of satellites formally acknowledged, but such satellites thus became an essential component of an international arms-control regime. Both parties also agreed not to interfere whit each others' NTM's of verification. Interference, as used in this agreement, may be understood to encompass measures such as interception but also actions such as jamming, sensor blinding, and spurious commands.

Disputes arising over compliance with the Treaty are to be brought before the Standing Consultative Committee (SCC). The SCC was formally established by a Memorandum of Understanding between the USA and the USSR in 1972.[11] The SCC is a bilateral commission charged with considering questions of compliance and reconciling any misunderstandings or uncertainties regarding the SALT I Agreements. It holds annual meetings at least twice a year and at the request of either party. Proceedings of the SCC are held in private and may not be made public except with the express consent of both parties.

While the Agreement clearly prohibits ABM weapons in outer space, it does not forbid the development or testing of anti-satellite (ASAT) technology. ASAT and ballistic missile defense (BMD) technologies overlap substantially, any testing done in an ASAT mode would be permitted, except ASAT weapons which are nuclear-armed and space-based.

Those following debates on missile defense in the United States will recognize that the ABM Treaty has been widely criticized. Those advocating a National Missile Defense (NMD) view the ABM Treaty as blocking the acquisition of any meaningful missile defense. Significantly, Article XV of the Treaty provides that "[e]ach Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the treaty. Such notice shall include a statement of the extraordinary events the notifying party regards as having jeopardized its supreme interests. Whether the proliferation of intercontinental ballistic missiles

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[8] See, "Treaty on Outer Space", Hearings Before the Committee on Foreign Relations, US Senate, 90th Cong., 1st Session, 1967, 17. Several theories have been proposed regarding the definition/delimitation of outer space. See Cheng, B., "The Legal Regime of Airspace and Outer Space: The Boundary Problem Functionalism versus Spatialism: The Major Premises", V Annals of Air and Space Law 323 (1980).

[9] See testimony of then Secretary of State Dean Rusk during the Outer Space Treaty Hearings, *ibid*., at 17.

[10] This would raise the possibility of testing sub-orbital lasers, for example, against strategic ballistic missiles or their elements in flight trajectory. See, Jones, A.M., "Implications of Arms Control Agreements and Negotiations for Space-Based BMD Lasers", in, Payne, K.B. (ed.), Laser Weapons in Space – Policy and Doctrine, Western Press, Boulder, 1983, 55 *et seq.*

[11] Memorandum of Understanding Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics Regarding the Establishment of a Standing Consultative Commission; signed and entered in to force on 21 December 1972.

(ICBMs) to states hostile to the US jeopardizes its supreme interests is now under intense debate in the US.

On May 20, 1999, the US Congress passed the National Missile Defense Act of 1999 by overwhelming margins in both Houses. President Clinton signed the bill into law on July 22, 1999[12]. The Act commits the United State to fielding a missile defense system "when technically feasible". The move represents a dramatic escalation in the US quest for a missile defense. With missile defense technology "near an historic phase in its favor" after decades of failures, pressure to renegotiate or withdraw from the ABM Treaty will continue to mount.

Biological and Toxins Convention 1972[13]

This Convention prohibits the development, production, stockpiling and acquisition of biological warfare agents and weapons including toxins.

The Convention uses the expression "peaceful purposes" which means that the use of toxins and biological agents is limited exclusively to prophylactic purposes and to the promotion of the "development and application of scientific discoveries in the field of bacteriology (biology) for the prevention of disease or for other peaceful purposes [Article X (1)].

The development, production and stockpiling of toxins and biological agents for "hostile purposes" is prohibited; parties to the Convention undertake to destroy all their existing stocks of such agents (Article I and II).

Only limited provisions are included with regard to handling compliance problems. Parties undertake to consult and cooperate with one another to resolve problems dealing with implementation of the Convention (Article V). This may take place through appropriate international procedures within the framework of the UN. Complaints regarding violation of the Convention can be lodged with the Security Council of the UN (Article VI).

Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War (1971)[14], "Hot Line" Modernization Agreement[15] Prevention of Nuclear War Agreement 1973[16]

In SALT I, the US and the USSR were particularly concerned about (1) the outbreak of nuclear war as a result of accident, unauthorized use of nuclear weapons, or miscalculation; (2) the failure of communications in crisis; and (3) the outbreak of nuclear war due to actions of third countries.

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[12] National Missile Defense Act of 1999

[13] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction. (1976) no.11 United Kingdom Treaty Series, Cmd 6397. Opened for signature on 10 April 1972; entered into force on 26 March 1975.

[14] Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War, (1972) 807 U.N.T.S. 57. Signed on 30 September 1971; entered into force, 30 September 1971. Referred to as the Accident Measures Act.

[15] Agreement on Measures to Improve the US-USSR Direct Communications Link, (1972) 806 U.N.T.S. 402. Signed on 30 September 1971; entered into force on 30 September 1971.

[16] 24 Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War , U.S.T. 1478. Signed on 22 June 1973; entered into force on 22 June 1973.

The Accident Measures Agreement requires the parties, *inter alia*, to notify each other immediately of signs of interference with their early warning systems or related communications facilities if such occurrences threaten nuclear war (Article III). Thus interference with early warning systems is considered as a threat which could risk the outbreak of nuclear war.

In the Prevention of Nuclear War Agreement each side undertakes to act in a manner " to prevent the development of situations capable of causing a dangerous exacerbation of their relations, as to avoid military confrontations and as to exclude the outbreak of nuclear war between them and between either of [them] and other countries" (Article I). Article II further requires the parties to refrain from the threat or use of force against the other Party, their allies, or other countries which may endanger international peace and security.

When read together, these two Agreements reveal an implied understanding amongst the parties of the need to avoid interfering with early warning satellites.

Finally, the Hot Line Modernization Agreement requires the establishment of two additional communications circuits between the two parties, using satellite communications systems. The Agreement prohibits interference with communications satellites involved in the Direct Communication Link.

The ENMOD Convention 1977[17]

This Convention aims at prohibiting the hostile use of potentially disastrous environmental modification techniques (EMT). It is relevant to outer space, chiefly due to the vantage point which earth orbital status imparts.

The dual-use nature of space technology is well exemplified in the area of EMT. This receives recognition in the preamble to the ENMOD Convention in which it is observed that the use of [EMT] for peaceful purposes could improve the interrelationship of man and nature and contribute to the preservation and improvement of the environment for the benefit of present and future generations. However, it is also recognized "that military or any other hostile use of such techniques could have effects extremely harmful to human warfare."

Prohibited techniques are defined as "any techniques for changing –through the deliberate manipulation of natural processes- the dynamics, composition, or structure of the earth, including its biota, lithosphere, hydrosphere, and atmosphere, or of outer space" (Article II). An "understanding" relating to Article II, which is part of the negotiating record, includes among examples of ENMOD techniques "changes in the state of the ozone layer, and changes in the state of the ionosphere".

The Convention has the serious limitation of not banning all environmental modification technologies for military or hostile purposes, but only for those which have "widespread, long-lasting or severe effects." No definition of these terms may be found in the Convention itself. Understandings which accompany the ENMOD Convention, and form part of its negotiating record define: "widespread" as encompassing an area of several hundred square kilometers; "long-lasting" as lasting approximately a season; and "severe" as involving significant disruption or harm to human life, natural and economic resources or other assets. Thus non-hostile

[17] The Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification Techniques, 31 U.S.T. 333. Opened for signature 18 May 1977; entered into force 5 October 1978.

techniques are not prohibited, regardless of their effects, nor are techniques which produce destructive effects below a certain threshold. This points to the more general difficulty in drawing an effective line between permitted and prohibited research that might relate to military uses.

The Convention explicitly stipulates that its provisions should not "hinder the uses of environmental modification techniques for peaceful purposes," which means that experimentation aimed at altering of natural phenomena may continue.

Another weakness of the Convention is that recourse to the Consultative Committee of Experts provided for in Article V to assist in the solution of problems arising out of the application of the Convention, is not mandatory.

SALT II 1979[18]

The SALT II bilateral Agreement resulted from a series of negotiations which began shortly after the US Congressional ratification of the SALT I Agreements. SALT II established a quantitative limit on *inter alia* ballistic missile delivery systems, warheads, and cruise missiles. Qualitative limits were also negotiated, controlling modernization or other alteration or replacement of agreed arsenals. In the present discussion, two articles are of particular relevance.

Pursuant to Article IX (1) (c), each party to the agreement agrees not to develop, test or deploy "systems for placing into Earth orbit nuclear weapons or any other kind of weapons of mass destruction, including fractional orbital missiles". The specific mention of delivery systems for "fractional orbital missiles" was designed to fill perceived lacunae of Article IV of the Outer Space Treaty. Although the FOBS system was tested extensively, no violation of article IV of the Outer Space Treaty occurred, since no nuclear warheads were ever used atop the missiles. Nevertheless, SALT II goes a step further by proscribing development, testing and deployment of such systems.

Article XII provides that each Party undertakes not to circumvent the provisions of this Treaty, through any other state or states, or in any other manner. This echoes article IX pf the ABM Treaty and is aimed at preventing transfer of technology leading to proliferation of such technology.

Finally, the agreement bans some encryption of the data that missiles send to their ground stations during test flights. This was included in the agreement to increase the verifiability of key provisions.[19]

[18] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms, (1979) 18 I.L.M. 1112. Signed on 18 June 1979; not in force.
[19] See Blacker, C.D. & Duffy, G. (eds) International Arms Control – Issues and Agreements, Stanford University Press, 1984, Stanford, 52.

Ballistic Missile Launch Notification Agreement 1988[20] and Prevention of Dangerous Military Activities Agreement 1989[21]

The Launch Notification Agreement provides for notification, no less than 24 hours in advance, of planned, launch area, and area of impact for any launch of a strategic ballistic missile (ICBM or SLBM), including the geographic coordinates of the planned impact area or areas of the reentry vehicles. In the 1989 Agreement, words and terms such as *lasers* and *interference with command and control networks* are defined.[22] This Agreement also codifies the use of lasers in peacetime, Article 2 stating, for example, that each Party shall take the necessary measures directed towards preventing the use of "…laser in such a manner that its radiation could cause harm to personnel or damage to equipment of the armed forces of the other Party".

The above mentioned bilateral agreements establish a limited regime which seeks to protect satellites identified to perform a specific function and a limited and particular goal between the US and former USSR. Existing protection is thus limited to 3 types of satellite: early warning systems, reconnaissance satellites, and communication satellites. The protection is also extended in application to the corresponding ground stations. These bilateral agreements may set precedents in codifying the norm of non-interference with Earth-orbiting objects. This is thought to have opened up the possibility of codifying other case specific satellites and the widening of the scope of protection beyond the bilateral level.

Chemical Weapons Convention 1992.[23]

The Chemical Weapons Convention (CWC) was negotiated within the Conference on Disarmament. It bans the production, acquisition, stockpiling, transfer and use of chemical weapons. Each Party undertakes to destroy chemical weapons and any chemical weapons production facilities it owns or possesses.

The CWC is the first arms control treaty to widely affect the private sector, and its provisions covering chemical facilities were developed with the active participation of industry representatives.

The Convention contains very intrusive verification measures which are set out in an Annex to the Convention. Two verification regimes are established to enhance the security of States Parties to the Convention and to preclude the possibility of clandestine chemical weapons production. The first provides a routine monitoring regime involving declarations, initial visits

[20] Agreement Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics on Notifications of Launches of Intercontinental Ballistic Missiles and Sub-Marine Launched Ballistic Missiles. Opened for signature 31 May 1988; entered into force 31 May 1988. Referred to as the Launch Notification Agreement.

[21] Agreement Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics on the Prevention of Dangerous Military Activities. Opened for signature 12 June 1989; entered into force on 1 January 1990.

[22] Fore the purpose of the 1989 Agreement, a *laser* "…means any source of intense, coherent, highly directional electromagnetic radiation in the visible, infrared, or ultraviolet regions that is based on the stimulated radiation of electrons, atoms or molecules". *Interference* is defined as "…actions that hamper, interrupt or limit the operation of the signals and information transmission means and systems providing for the control of personnel and equipment of the armed forces of a Party".

[23] Chemical Weapons Convention 1992. Opened for signature 13 January 1993; entered into force 31 October 1996.

and systematic inspections of chemical weapons storage, production and destruction facilities and relevant chemical industry. The second regime, challenge inspection, allows a State Party to request and have conducted an international inspection of any facility or location in another State Party in order to clarify and resolve questions of possible non-compliance. To deter abuse, the Convention contains provisions for both the requesting and inspected Parties to have their concerns about compliance and possible abuse of the system addressed by the Executive Council at both the beginning and conclusion of a challenge inspection. The Convention also contains inspection procedures which provide the inspected party with means to protect sensitive sites. Such means include: the timing specified to provide access; limitations on observers; and the process of managed access at the site.

The verification regime, though intrusive, respects industry's legitimate concerns in safeguarding proprietary information and avoiding disruption of production.

States Parties have the obligation to promote the Convention's effectiveness through domestic implementation and responsible, active participation in the organization for the Prohibition of Chemical Weapons (OPCW).

Article VI stipulates that States Parties must submit annual industry declarations pertaining to activities not prohibited under the Convention. States Parties must also establish "penal" legislation that would make CWC violations also a violation of national law. This provides an enforcement mechanism rarely found in international law. The Convention also penalizes countries that do not join. Non-participating States are barred from access to certain treaty-controlled chemicals.

The negotiators recognized the need for making the Convention a "living document" which will allow for the possibility of improvement based on inspection experience and advances in verification technology. The CWC contains provisions to allow for technical changes and annual and special conferences to discuss implementation and address any particular problems.

Another issue of importance was that of equitable participation in the OPCW in particular the Executive Council since it plays a large role in CWC implementation. The Convention establishes the principle of rotational seats on the Executive Council and seat allocation on a regional basis, leaving it up to each region to designate members, taking into account not only a State's industrial significance but also other regional factors.

The successful completion of this multilateral convention was no doubt facilitated by the signing of a US- USSR bilateral entitled Agreement on Destruction and Non-Production of Chemical Weapons and on Measures to Facilitate the Multilateral Chemical Weapons Convention.[24] Recognizing their special responsibility in the area of chemical weapons disarmament, the US and USSR agreed to destroy significant quantities of chemical weapons and make every effort to conclude and to bring into force at the earliest date, a convention providing for a global ban on the development, production, stockpiling and use of chemical weapons and on their destruction.

[24] Signed and entered into force 1st June 1990.

Comprehensive Test Ban Treaty (CTBT) 1996[25]

The CTBT was also negotiated in the Conference on Disarmament. By its own terms, the Treaty cannot enter into force until it has been ratified by the United States and 43 other specified states with nuclear power or research reactors. So far, it has been signed by all those specified states except for India, Pakistan, and North Korea, and it has been ratified by 30 of the required 44, including Britain, France and Russia. The US has not ratified the Treaty.

State Parties undertake not to carry out any nuclear weapon test explosion or any other nuclear explosion; to prohibit and prevent any nuclear explosions at any place under its jurisdiction or control; and to refrain from causing, encouraging, or in any away participating in the carrying out of nuclear weapon test explosion or any other nuclear explosion. (Article I).

By outlawing all nuclear explosions, parties to the Treaty accept a constraint on their ability to develop new types of nuclear weapons. The CTBT in conjunction with other measures, slows the acquisition and advancement of nuclear weapon capabilities while nuclear weapon states decide how fast and how far to go with nuclear reductions.

Support for "zero yield" CTBT by countries such as the US had been linked to the establishment of safeguards that define the conditions under which a country can enter into a CTBT. These safeguards are:
(1) the conduct of a science based stockpile stewardship program to ensure a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile; (2) the maintenance of nuclear laboratory facilities and programs; (3) the maintenance of the basic capability to resume nuclear testing activities prohibited by the treaty; (4) continuation of a comprehensive research and development program to improve treaty monitoring capabilities and operations; (5) the continuing development of a broad range of intelligence gathering and analytical capabilities and operations; (6) possibility of with drawing under the "supreme national interests" clause.

Article II establishes the Comprehensive Nuclear Test-Ban Treaty organization (CNTBTO) which will ensure treaty compliance and provide States Parties with a forum for consultation and cooperation. The principal decision-making body is the Executive Council, composed of 51 members. Members are selected taking into account geographical distribution and reflect the nuclear capabilities.

Article IV and the verification protocol establish the treaty's verification regime which consists of four (4) basic elements:

- an International Monitoring System (IMS)
- consultation and clarification
- on-site inspections
- confidence-building measures (CBMs)

The purpose of the IMS is to detect and identify nuclear explosions prohibited under the treaty. The system is composed of a network of seismological monitoring stations designed to detect seismic activity. The host state and location of each facility is listed in Annex 1 to the Protocol.

[25] The Comprehensive Test Ban Treaty 1996. Opened for signature on 24 September 1996; not entered into force yet. As of 2000 it has been signed by 160 countries and ratified by 69.

Information collected by the IMS is to be transmitted to the International Data Center (IDC) – a part of the Technical Secretariat responsible for data storage and processing. The IDC must make both raw and processed information available to all states parties.

The consultation and clarification component encourages states parties to attempt to resolve, either amongst themselves or through the organization, possible instances of non-compliance before requesting an on-site inspection. Clarification of ambiguous events must be provided within 48 hours of receiving a request from another state party or from the executive Council.

If the consultation and clarification mechanism does not resolve the issue, each state party has the right to request an on-site inspection in the territory of the party in question. The inspection request must be based on information collected by the IMS, obtained through NTM of verification or a combination of IMS and NTM information.

The verification regime also build in confidence-building measures to promote treaty compliance. To minimize the misinterpretation of data, each state party will voluntarily provide the Technical Secretariat with notification of any chemical explosion involving a magnitude of 300 tons or more of TNT equivalent on its territory.

Under Article XIV, the treaty will not enter into force until it has been signed and ratified by 44 states – including the five nuclear-weapon states (US, Russia, Britain, France and China) and the three 'threshold states" (India, Israel and Pakistan) – listed in Annex 2 of the treaty. The 44 states are all members of the CD, possess nuclear power and research reactors as determined by the International Atomic Energy Agency (IAEA).

ABM Treaty Demarcation Agreements 1997[26]

On 26 September 1997, the US and Russia signed a package of 4 agreements modifying the ABM Treaty, namely:

- A Memorandum of Understanding on "multilateralization" specifying that Russia, Ukraine, Belarus, and Kazakhstan will jointly succeed the Soviet Union as parties to the treaty
- A first agreement, the so-called "low-velocity agreement" covering theater defenses whose interceptors have speeds of 3km/sec or lower
- A second agreement, the so-called "high-velocity agreement" covering theater defenses with interceptors faster than 3km/sec
- An Agreement on confidence building measures

The ABM Treaty limits ABM systems that are defined as systems "to counter strategic ballistic missiles or their elements in flight trajectory". The term "strategic ballistic missile" is not defined leaving open the question of what constitutes a "strategic ballistic missile" as opposed to a "theater ballistic missile". Pursuant to Article VI of the Treaty, the parties agreed not to give non-ABM systems "capabilities to counter strategic ballistic missiles or their elements in flight trajectory" and not to test non-ABM systems "in an ABM mode". However, the Treaty does not

[26] First Agreed Statement Relating to the ABM Treaty; Second Agreed Statement Relating to the ABM Treaty; a Confidence-Building Measures Agreement, and the Regulations of the Standing Consultative Commission. Opened for signature 26 September 1997.

specify how to determine whether a defense is strategic-capable or has been tested in an ABM mode.

Following the Gulf War, the US started investing more heavily in developing new and more capable theater missile defenses. It became clear that some of these systems fell into a gray zone thus prompting the US into entering negotiations with Russia to clarify the ABM Treaty's restrictions on theater missile defenses and to establish a demarcation between permitted theater defenses and prohibited strategic defenses.

Under the provisions of the lower-velocity agreement, theater missile defense systems [other than the US so called Navy Upper Tier] can be tested and deployed with any architecture, including space-based cuing, as long as interceptors are never tested against a target with a velocity greater than 5km per second or a range greater than 3,500km. The higher velocity systems are subject to the same test standard. However, the determination of compliance with the Treaty is a unilateral national responsibility. Thus, the US Administration has determined that all theater missile defense systems are Treaty compliant and has certified this to the Congress.

The new agreements also explicitly prohibit space-based interceptors for theater missile defense applications.

Joint Early Warning Center Agreement 2000[27]

This Memorandum of Agreement (MOU) established a Joint Data Exchange Center (JDEC) in Moscow for the exchange of information derived from each side's missile launch warning systems on the launches of ballistic missiles and space launch vehicles. The warning systems in this case are the space-based satellites, infrared systems, and the early warning radars each possesses. The JDEC is also intended to serve as the repository for the notifications to be provided as part of an agreed system for exchanging pre-launch notifications on the launches of ballistic missiles and space launch vehicles.. The system is to be set up in phases, and by the end of the third phase, it will include information on ballistic missile and space launches of third parties.

A space launch vehicle shall be considered as "belonging to" a Party if it owned, possessed or controlled by the Party or by any corporation, partnership, joint venture, association or other legal or natural person (either government or private, including international organizations) organized or existing under the laws of the Party.

Parties will use the following parameters launch time, launch location, generic missile type, launch azimuth, impact area, estimated time of payload impact, indication of single or multiple launch. Each Party is to provide processed launch information in a time frame that is near real time, if possible.

At its discretion, each Party can also provide information on other launches and objects capable of disrupting the normal operation of equipment of the warning systems of the Parties.[28]

[27] Memorandum of Agreement Between the Government of the United States and Government of the Russian Federation on the establishment of a Joint Center for the Exchange of Data from early Warning Systems and Notifications of Missile Launches.

[28] Article 3 (2) "…may also provide information on other launches and objects, including de-orbiting spacecraft, and geophysical experiments and other work in near-eart space…"

The MOU entered into force on the date of its signature and shall remain in force for ten years. Upon agreement of both Parties, it may be extended for successive five-year periods. Upon six month written notice to the other Party, the MOU may be terminated. This differs from termination clauses found in other arms control agreements where termination is subject to fundamental changes or reasons of national security.

The JDEC is though to be a means of increasing mutual confidence between both parties about the effectiveness of their early warning systems, as well as providing a way to focus attention on the continuing worldwide proliferation of ballistic missiles.

Outer Space Treaty 1967[29]

Referred to as the *Magna Carta* of outer space law, the Outer Space Treaty has been ratified by close to 100 States, including all of the major space-faring countries. As its full title implies, it established a series of principles which were later built upon in subsequent space law treaties.

A general principle which permeates the text and reflects the expectations of the negotiating parties, appears in the Preamble of the Treaty. It embodies a recognition of the "common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes".

As far as the basic legal regime of outer space is concerned, the key principles of the Treaty are found in Articles I and II. Article I declares that outer space, including the moon and other celestial bodies, is "the province of all mankind" and "shall be free for the exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law". Pursuant to Article II, outer space, including the Moon and other celestial bodies is not "subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means".

Since the inception of space activities, States have acted as if these freedoms were part of international law and no nation is known to have formally questioned their authority. For this reason, there is a widespread agreement that the principles of freedom of exploration and non-appropriation are part of customary international law.

Article III specifies that the exploration and use of outer space, including the Moon and celestial bodies, is to be carried out "in accordance with international law including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."

Article IV contains the only provision of the Outer Space Treaty dealing directly with military activities. Under Article IV (1) states shall not place " in orbit around the earth any objects carrying nuclear weapons or any kind of weapon of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner". Though the term "weapons of mass destruction" is not defined, it is generally understood to

[29] Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 610 U.N.T.S. 205, 18U.S.T. 2410. Opened for signature 27 January 1967; entered into force 10 October 1967

include biological, radiological and chemical weapons, as well as any future weapons whose destructive potential would be catastrophic.

Article IV (2) stipulates that the "moon and other celestial bodies shall be used by all states parties exclusively for peaceful purposes". The same paragraph also bans the establishment of "military bases and installations, the testing of any kind of weapons, and the conduct of military maneuvers on the moon and other celestial bodies". The "peaceful purposes" clause applies only to the moon and other celestial bodies but not to "outer space".

The term "peaceful purposes" has been interpreted consistently by some as meaning "non-aggressive" and by others, as meaning "non-military". State practice has endorsed the "non-aggressive" interpretation as *de facto* the correct one. [30]

The Outer Space Treaty therefore does not prohibit the development, testing, and deployment of ground-based or space-based non-nuclear ASAT systems. Fixed ground-based systems that can reach targets in space using conventional, nuclear, or directed-energy kill mechanisms are also permissible.

Fractional Orbital Bombardment Systems (FOBS) in existence at the time of ratification of the Outer Space Treaty, although clearly weapons of mass destruction, are not prohibited by the Outer Space Treaty because they do not complete a full orbit. SALT II does however include a provision prohibiting new FOBS systems.

The Treaty left open the possibility of placing conventional weapons. It does not prohibit laser and other directed-energy weapons that are discriminate in character. Article IV also only prohibits the stationing of nuclear weapons in outer space. It does not cover development or ground-testing of weapons designed to be placed in space, nor the deployment on the ground of nuclear powered weapons, such as "pop-up weapons" designed for use against space objects. It does not cover non-nuclear ASAT or BMD weapons.

Article IX requires States Parties to undertake international consultation before proceeding with any activity that would cause potentially " harmful interference" with the "peaceful exploration and use" of outer space by other States.

Since the term "harmful interference" is not defined in the treaty, the question could be raised whether the words "harmful interference with activities in the peaceful exploration and use of outer space" also cover military activities in outer space.

The Treaty contains no verification provisions.

The 1967 Outer Space Treaty prohibits the orbiting of weapons of mass destruction and the stationing of such weapons on the moon or on any other celestial body. The continuing advance of technology also makes it possible to orbit conventional missile interceptors, or exotic weapons based on other physical principles (such as space-based lasers) capable of harming both space-based and land, sea or air based targets. This issue was first brought to the fore by a Canadian prime Minister speaking at the UNSSOD II when he when he referred to the Outer

[30] See, Stojak, M.L., Legally Permissible Scope of Military Activities and Prospects for their Future Control, D.C.L. Thesis, McGill Univeristy, 1986 (unpublished), pp. 118-135.

Space treaty 1967 as being "evidently inadequate" a mere fifteen years after its entry in to force".[31]

The Registration Convention 1975[32]

The Registration Convention establishes a mandatory system of registration for space objects launched into orbit and beyond. Three reasons have been advanced for the establishment of a central registry: effective management of traffic; enforcement of safety standards; and imputation of liability for damage.

Though the central registry is the most significant feature of the Treaty, it fulfils several other important objectives. Launching countries must maintain a national registry (Article II). Article IV of the Convention requires mandatory reporting to the Secretary-General of the United Nations of information on a number of data, such as the date and location of the launch, changes in orbital parameters after the launch, and the recovery date of the spacecraft. This information is to be transmitted "as soon as practicable"(Article IV(3)). Furthermore, States are not obliged to reveal the true function of a satellite, only the "general function of the space object" is to be reported (Article IV(1)(e))

It is worth mentioning that so far no registered launchings have ever been described as serving military purposes or having a military function.

Moon Treaty 1979[33]

Of the five multilateral treaties devoted entirely to outer space, the Moon Treaty is the most recent and enjoys the least support. As of July 1999, only nine nations have ratified the Moon Treaty.[34] Objections to provisions regarding the establishment of an international regime to govern the exploitation of the Moon's natural resources when feasible, and differences over the interpretation of the Moon's natural resources as "the common heritage of mankind" have kept space faring nations and others from ratification

Article 3 of the Treaty contains the only provision addressed to military activity. This article forbids the placement of weapons of mass destruction including nuclear weapons on the moon itself, in orbit around the moon, or trajectories to and around the moon, and on other celestial bodies (Article 3(3)). Article 3(2) prohibits "any threat or use of force or any other hostile act or threat of hostile act on the moon" Given the fact that the treaty already specified that activity on the Moon must occur pursuant to international law, and the provision on the "threat or use of force" simply echoes the language of Article 2(4) of the UN Charter.

Paragraph 4 forbids "the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres" on the moon.

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[31] "Technology Momentum, the Fuel That Feeds the Nuclear Arms Race", an Address by the Right Honourable P.E. Trudeau, to the Second United Nations Special Session on Disarmament, New York, 18 June 1982, Statements and Speeches, External Affairs, Canada.

[32] Convention on the Registration of Objects Launched into Outer Space, 1023 U.N.T.S. 15, 28 U.S.T. No.8480. Opened for signature on 14 January 1975; entered into force on 15 September 1976.

[33] Agreement on the Activities of States on the Moon and Other Celestial Bodies, (1979) I.L.M. 1434. Opened for signature on 5 December 1979; entered into force 11 July 1984.

[34] Australia, Austria, Chile, Mexico, Morocco, Netherlands, Pakistan, Philippines and Uruguay.

As regards verification, parties to the Treaty are allowed to inspect all space vehicles, equipment, facilities, stations and installations belonging to any other party.

The Moon Treaty makes a very modest extension to pre-existing space law.

International Telecommunications Convention[35]

The presently applicable International Telecommunication Convention was adopted in 1992 in Geneva.

The International Telecommunications Union (ITU), through its Radio Regulations Board (RRB) governs the international use of the radio spectrum. As a limited natural resource, the spectrum will support only a finite number of users among the radio frequencies before signal interference begins to occur. As a result, a coordinated global effort to ensure the rational and efficient use of the radio spectrum becomes the *sine qua non* of the world-wide telecommunications capability.

Article 35 of the Convention provides that "all stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other members…".

The term "harmful interference" has been defined in the convention as an act which "…endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with radio Regulations" (Annex 2).

Under the provisions of article 38 (2) members have full freedom in respect to their national defense installations, including the services for the army, navy and air force.

[35] Constitution and Convention of the International Telecommunication Union: Final Acts of the Additional Plenipotentiary Conference, Geneva 1992, (Geneva: ITU, 1993)

THE NON-WEAPONIZATION OF OUTER SPACE

Preliminary Remarks Concerning the Appropriate Forum for Discussion

An ancillary question raised by all proposals is the controversy over the appropriateness of forums, i.e. whether the Conference on Disarmament (CD) or the Committee on the Peaceful Uses of Outer Space (COPUOS) should discuss issues such as the amendment of the Outer Space Treaty, drafting of a new Protocol to the Treaty, and issues dealing with arms control and outer space.

This controversy has been on-going for years. In 1983, the General Assembly's Special Political Committee (SPC), which is responsible for reviewing the reports submitted to it by COPUOS, held discussions on extending COPUOS' jurisdiction to include the military use of outer space. This met with fierce opposition from the US who considered the CD to be the sole forum for all disarmament matters, including arms control in outer space. Resolution 38/80, which dealt with all aspects of the work of COPUOS, was adopted by the General Assembly by a vote of 124 in favor, 12 against and 8 abstentions.[36] The resolution requested, as a matter of priority, questions relating to the militarization of outer space, taking into account that the CD was requested to consider the question of preventing an arms race in outer space.

In recent years, the wording of what COPUOS is to consider has somewhat been modified. COPUOS' agenda currently includes the item "Ways and Means of Maintaining Outer Space for Peaceful Purposes". In its last report, COPUOS members voiced concern over development and testing of weapon systems, and over recent use of space systems for military purposes. These were perceived by some delegations as means of intensifying militarization of outer space and lead to an arms race in outer space. In addition, COPUOS should consider the possibility of establishing a mechanism to coordinate work with other bodies, notably the CD.

Though the appropriate forum issue has not been settled, subtle shifts in wording, an increased membership of both bodies[37] and the emphasis placed on international collaboration in space applications at the recent UNISPACE III Conference[38] would indicate that members could in principle agree that the negotiation of any new multilateral agreement(s) dealing with arms control and outer space should be carried out by the CD with appropriate feedback to the COPUOS. Whether the latter is at present the best road to follow will be discussed later in this paper.

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[36] See UN Doc. A/RES/38/80, 15 December 1983. Negative votes cast by: Australia, Belgium, France, Federal Republic of Germany, Israel, Italy, Japan, Luxembourg, the Netherlands, New Zealand, UK, US. Abstaining were: Canada, Denmark, Finland, Iceland, Norway, Portugal, Spain, Sweden.

[37] Current membership of the CD is 66. The following countries are members of the CD but not of COPUOS: Algeria, Bangladesh, Belarus, Democratic republic of Congo, Ethiopia, Finland, Ireland, Israel, Myanmar, New Zealand, Norway, Slovakia, Sri Lanka, Switzerland, Tunisia, Zimbabwe. Current membership of COPUOS is 61. The following countries are members of COPUOS but not the CD: Albania, Benin, Burkina Faso, Chad, Czech Republic, Greece, Lebanon, Nicaragua, Niger, Portugal, Sierra Leone, Sudan, Uruguay, Philippines.

[38] Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, "Space Benefits for Humanity in the Twenty First Century", Vienna, 19-30 July 1999.

I. Proposals Related to Existing Agreements

A. Outer Space Treaty 1967

Most of the initiatives to improve the Outer Space Treaty attempt to close the gap regarding the placing into orbit of conventional or other weapons which are not considered to be weapons of mass destruction

Under Article XV of the Treaty, any State Party to the treaty may propose amendments.

In 1968, Italy submitted a request to the Twenty Third Session of the UN General Assembly, requesting the inclusion of an additional item in the agenda, namely "the necessity of amending Article IV of the Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies"[39].

Concerned by existing fractional orbital bombardment systems (FOBS) the amendment sought to prohibit placing nuclear weapons or any other kinds of weapons of mass destruction " in complete or partial orbit, around the Earth or around any other celestial body (emphasis in original)".

Though the amendment proposal was made to the UN General Assembly, the draft resolution stipulates that upon a favorable vote by the UN General Assembly, the later is to submit the issue for further study to the Conference of the Eighteen-Nation Committee on Disarmament (ENDC). The ENDC was to promote the steps necessary for the amendment of the Treaty and submit concrete proposals to the Twenty Fourth Session of the UNGA. The proposal was never submitted to the ENDC.

A Memorandum suggesting the drafting of a Protocol of the Outer Space Treaty's provisions was submitted by Italy to the Conference on Disarmament in 1979[40]. This was largely inspired by the series of negotiations held between 1977-1979 between the US and the Soviet Union on limiting ASAT systems.

The document suggested a total ban on such military activities as the development and use of earth or space-based systems designed to damage, destroy, or interfere with the operations of other States' satellites.

States Parties to the Protocol would undertake:

> "to refrain from engaging in, encouraging or authorizing, directly or indirectly, or in any way participating in any measures of military or hostile nature, such as the establishment of military bases, installations and fortifications, the stationing of devices having the same effect, the launching into orbit or beyond of objects carrying weapons of mass destruction or any other types of devices designed for offensive purposes, the conduct of military manoeuvres, as well as the testing of any type of weapons".

[39] UN Doc. A/7221, 10 September 1968.
[40] "Additional Protocol to the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" with a view to Preventing an Arms Race in Outer Space," CD/9, 26 March 1979.

This provision would fill the lacunae left by Article IV of the Outer Space Treaty, and extend existing prohibitions on the stationing and testing in Earth orbit or beyond to all weapons.

The Memorandum also specified that space systems which contribute to arms control verification and the maintenance of international security should not be banned . Thus the use of reconnaissance, surveillance and communications satellites were not prohibited.

The memorandum also supported the development of proposals to establish a basis for the use of technical means of multilateral verification, and the creation of the International Satellite Monitoring Agency (ISMA) as proposed by France in 1978.[41]

Peru and Venezuela also made proposals to the CD on amending the Outer Space Treaty.[42]

The Venezuelan proposal first advocated amending Article IV of the Outer Space Treaty by adding the words "or any type of space weapons". It also proposed the insertion of a new paragraph under which State Parties would undertake not to develop, produce, store or use space weapons. It was also suggested (1) that the ban on the deployment of nuclear weapons or any weapons of mass destruction in space be extended to "…any other kind of weapon that could be conceived for use in space, from space or into space", and that (2) there be an amendment calling on States "…not to place in orbit around the earth, or deploy in their territories or any other place under their jurisdiction, any kind of space weapons or systems of such weapons.[43]

The Peruvian delegation suggested a wider ban and advocated the negotiation of an additional Protocol for the purpose of prohibiting the development, production, storage and deployment of ASAT weapon-systems which are not stationed in outer space.[44]

On the issue of verification of a total ban on space weapons, the Venezuelan delegation proposed that there be a Protocol setting forth appropriate verification mechanisms to supplement Article IX and XII of the Outer Space Treaty, and on the issue of Earth-based space weapons, it proposed a mechanism that "…could benefit from the techniques and methods applicable to long-range and intermediate-range nuclear forces".

These proposals clearly differentiated themselves from previous proposals in that they attempt to cover development, production, storage and use of space weapons. They also address different application modes of space weapons: space-to space, space-to-Earth and Earth-to-space.

While all of these proposals have found some support within the CD, they have not been further pursued.

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[41] "Note verbale dated 30 May 1978 from the Permanent Mission of France addressed to the Secretariat," Official Records of the General Assembly, A/S-10/AC.1/7, 1 June 1978.

[42] For Peru, see "Proposal for Amendment of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies," CD/939, 28 July 1989. For Venezuela, see "Statement submitted by Venezuela to the Conference on Disarmament", CD/PV 398, 19 March 1987.

[43] CD/PV 471, at 24.

[44] CD/939, at 2.

B. ABM Treaty 1972

Calls for multilateralizing the ABM Treaty have primarily been aimed at encouraging the US and Russia to extend to satellites of third countries the arrangements concerning the immunity of certain space objects already agreed between them bilaterally.[45]

Other proposals have aimed at extending some of the limitations found in the ABM Treaty to "other technologically advanced States".[46]

To date, neither the US nor Russia have formally supported the idea of multilateralization of the ABM Treaty.

Nevertheless, the proposals could be incorporated into future outer space arms control agreements.

C. Registration Convention 1975

In general, the proposals to reinforce the registration Convention are centered on the provisions of Article IV. Perceived shortcomings of this provision include the fact that not a single State has registered a single satellite as having military applications. In most cases, notifications have been submitted to the UN registry two to six months after launch.

Various proposals have been advanced to resolve these perceived shortcomings.[47]

In order to enhance knowledge of spacecraft, and in particular to clarify responsibilities in the event of an incident, it has been suggested that the register should also include the following information or demand the following actions: the orbital characteristics of each satellite; details of its maneuverability; announcing manoeuvres of spacecraft in advance; information on energy sources available on board; certain other functional characteristics (mass, size, expected life of the space vehicle); to reduce the time taken to notify the Secretary General of information; to establish a fixed interval between the time of the launch and the time of notification; the possibility of informing the United Nations Secretary-General of launch forecasts; and to update information regularly.

All of these proposals reflect the positions of delegations which sustain the viability of the Registration Convention as an instrument via which some outer space activities of military value may be governed. It should be noted that that this view is not shared unanimously.[48] Several delegations are of the opinion that the Registration Convention is neither an arms control

[45] See, "Statement submitted by Australia to the Conference on Disarmament", CD/PV 279; "Prevention of an Arms Race in Outer Space", CD/375, 14 April 1983; "Statement submitted by the Federal Republic of Germany to the Conference on Disarmament", CD/PV 345, 6 March 1986.

[46] See, "Statement submitted by Pakistan to the Conference on Disarmament", CD/PV 367, 3 July 1986.

[47] Argentina, "Proposals for the Strengthening of the Regime Established by the Convention on Registration of Objects Launched into Outer SpaceD/1015, CD/OS/WP.42, 18 July 1990.. "Prevention of an Arms Race in Outer Space: Confidence Building Measures and Transparency," Working paper submitted by France to the Conference on Disarmament, CD/1092, 1 August 1991, at 3. Australia and Canada, CD/PV 468.

[48] Statement submitted by Japan to the Conference on Disarmament", Conference on Disarmament, CD/PV 419, 7 July 1987, at 12. United States, CD/905.

nor a confidence building instrument, but a legal instrument establishing an international registry of space objects for the purpose of giving practical effect to the 1972 Liability Convention[49].

It is suggested that sharing and providing more precise information along the lines of those mentioned above should be provided by States on a voluntary basis as a means of building confidence. Then, depending on the scope of any new agreements (either bilateral or multilateral) dealing with space weapons, such notification and information procedures could be incorporated into these or could form part of a separate set of confidence-building measures adopted for the outer space environment.

II. Proposals for a New Agreement

A. 1981 Soviet Draft

In response to the operational US Space Shuttle, and the announced plans for a US air-launched ASAT system, the Soviet Union submitted a Draft Treaty first to the UN General Assembly in 1981 and secondly to the Committee on Disarmament in 1982.[50]

Article 1 (1) advocates an undertaking "… not to place in orbit around the earth objects carrying weapons of any kind, install such weapons on celestial bodies, or station such weapons in outer space in any other manner".

Because it prohibited only weapons stationed in orbit, Article 1 would allow testing, development and deployment of ground-based or air launched ASAT systems. It would, however, have prohibited the development of space-based BMD systems.

Article 3 called upon States Parties not to destroy, damage, disturb the normal functioning of, or change the flight trajectory of space objects of other States Parties, "if such objects were placed in orbit in strict accordance with article 1 of this Treaty". The latter part seems to countenance the use of force against another's satellite believed to be a weapon and in contravention of Article 1, even though that term is capable of differing interpretations, especially when applied prospectively to "other types" developed in the future. This right of attack on suspicion would have been highly destabilizing and was thus unacceptable to many delegations.[51]

Article 4 of the Draft Treaty confined the compliance provisions to the use of National Technical Means (NTM) of verification. The article also contained non-interference with these NTM of verification.

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[49] Convention on International Liability for Damage, 24 U.S.T. 2389, T.I.A.S. No. 7762. Entered into force on 1 September 1972.

[50] "Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space", U.N. General Assembly, Doc.A/36/192,20 August 1981. Also submitted to the CD "Letter Dated 6 April 1982 from the Representative of the Union of Soviet Socialist Republics Addressed to the Chairman of the Committee on Disarmament Transmitting the Draft Treaty on the Prohibition of Stationing of Weapons of Any Kind in Outer Space Submitted to the Thirty-Sixth Session of the General Assembly", CD/274, 7 April 1982

[51] See for example the Netherlands, CD/PV 170, France, CD/PV 171, the Federal Republic of Germany, CD/PV 172.

B. 1983 Soviet Draft

In 1983, the Soviet Union tabled another motion on outer space at both the UN General Assembly and the CD.[52] This Draft Treaty proposed that the use or threat of use of force in outer space, the atmosphere, and on the earth be prohibited. It is not clear why this was included as it amounts to a reiteration of Article 2(4) of the UN Charter. Article 1 goes on to state that space objects are not to be used to threaten objects in "outer space and the atmosphere and the on the Earth", and space objects themselves are not to be threatened. This article would prohibit threats from space-based assets such as ASAT or BMD weapons, and threats to space-based assets, whether ground, air, sea or space-based.

Article 2 is a reformulation of the 1981 Soviet Draft and contains several undertakings. It prohibits testing or deployment of space-based weapons aimed at destroying objects on the Earth, in the atmosphere, or in outer space. Article 2 also provides for the non-interference with space objects of other Parties, either by destroying, damaging, or disturbing the normal functioning, or changing the flight trajectory, of such objects. The proposal also introduced an obligation not to "test or create" new ASAT systems and to destroy any such systems they might already possess.

Moreover, though the 1983 Draft Treaty maintained NTMs of verification for ensuring treaty compliance, a provision was also included whereby States could have "…recourse to appropriate international procedures within the United Nations and in accordance with its Charter…", including recourse to a Consultative Committee of State Parties to the Treaty (Article 5).

C. Union of Concerned Scientists (UCS) Draft 1983

In 1983, a group of concerned scientists prepared a Treaty Limiting Anti-Satellite Weapons. The document was prepared under the auspices of the Union of Concerned Scientists (UCS)[53].

The proposal was for a bilateral treaty. However, once agreement between the United States and the Soviet Union would be reached, a multilateral accord open to all nations was seen as desirable.

The treaty has three essential elements. First, the signatories would undertake not to destroy, damage, render inoperable or change the flight trajectories of space objects.

Second, the signatories would undertake not to test in space or against space objects weapons for destroying, damaging, rendering inoperable, or changing flight trajectories of space objects. Furthermore, the signatories would undertake not to place such weapons in orbit or to station them on celestial bodies or in outer space in any other manner.

Treaty compliance would be verified by national technical means, supplemented by cooperative measures agreed upon by the Parties in the framework of the Standing Consultative Commission, as established in the ABM Treaty.

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[52] "Treaty on the Prohibition of the Use of Force in Outer Space and From Space Against the Earth" U.N. Doc. A/38/194, 26 August 1983. "Letter Dated 19 August 1983 from the first Vice-Chairman of the Council of Ministers of the Soviet Socialist Republics, Transmitting the text of a Draft treaty on the Prohibition of the Use of Force in Outer Space and From Space Against the Earth", CD/476, 20 March 1984.

[53] For the full text of the Draft Treaty consult the following web site: http://www.ucs.org

Noting that the 1978-1979 negotiations between the US and the Soviet Union dealt with reaching agreement on a comprehensive ban, the UCS underlined the difficulties in verifying such a comprehensive ban and thus, addressed itself to the question of banning ASAT testing.

In contrast to the 1981 Soviet Draft Treaty, the UCS Treaty does not allow the use or testing of ground-based or space-based ASAT weapons. It also forbids the Parties from destroying any space object, including their own.

Though a ban on the use and testing in space of ASAT weapons cannot by itself protect satellites, it could provide a severe impediment to the further development of ever more capable ASAT weapons.

It should be noted that the ASAT limitations proposed by the UCS would not ban any ABM activity already permitted to both sides in the ABM Treaty. The initial ban on ASAT testing would be the first step and would then be augmented by a wider agreement to dismantle existing ASATs.

D. China Proposal

The most recent proposal for a new agreement on preventing an arms race in outer space was made by the delegate of China to the Conference on Disarmament.[54]

The primary goal is to prevent the weaponization of outer space by banning the testing, deployment and use of weapons, weapon systems and components in outer space. Countries with the greatest space capabilities would bear a special responsibility for preventing the weaponization of an arms race in outer space and ensuring that space be used for peaceful purposes.

The proposal does not contain any specific treaty provisions but rather highlights several issues which would need to be addressed by such a Treaty. States Parties to the treaty would commit themselves not to test, deploy or use weapons, weapons systems or components of weapons systems in outer space. Consideration should also be given to a provision providing for permissible activities, thus helping to distinguish between activities that are prohibited and those that are not.

Definitions of terms such as “outer space”, “space weapons”, “weapon systems” and “components of weapon systems” should also be included.

Appropriate verification measures as necessary and appropriate are a key component of any future agreement. Mechanisms for consultations, clarification and possible dispute resolution in order to increase transparency and address suspicions should also be included.

The Chinese proposal certainly contains many similar suggestions to those advanced by countries such as Canada, Russia, Sweden and France. It is broader in terms of its application

[54] “Letter dated 9 February 2000 from the Permanent Representative of China to the Conference on Disarmament Addressed to the Secretary-General of the Conference Transmitting a Working Paper Entitled “China’s Position on and Suggestions for Ways to Address the Issues of Prevention of an Arms Race in Outer Space at the Conference on Disarmament”, CD/1606.

than the Canadian proposal in that it seeks to prohibit testing, deployment or use not only of weapons and their components but of weapon systems[55]. The term "weapon systems" would encompass space technologies such as boosters, satellites and their components, and Earth-based control and tracking systems. Clearly, attempts to prohibit these latter technologies would meet with much resistance, and is not a realistic goal.

The idea of selecting "permissible activities" also echoes past suggestions made by Canada and France. Verification is highlighted as a key element to the successful negotiation for an arms control treaty in outer space.

Building in CBMs to enhance mutual trust is also likely to gain support.

Vis-à-vis all of these proposals for new agreements, the US continues to say that a broad regime of regulation already exists and this regime is quite effective and sufficiently rigorous.[56]

III. Confidence-Building Measures (CBMs)

Confidence-building measures (CBMs) are viewed by many as practical initial steps towards more ambitious arms-control approaches. They are increasingly accepted as an important element in reducing suspicions and increasing trust amongst nations. CBMs are primarily of a political nature and can not substitute for concrete steps to reduce or limit arms. Given the potential difficulties in negotiating multilateral treaties dealing with arms control and outer space activities, CBMs have received greater attention in the CD. Proposals put forward generally fall under three broad headings:

- measures to increase the transparency of space operations;
- measures to increase the type of information concerning satellites;
- measures establishing rules of behavior governing space operations.[57]

IV. Code of Conduct and Rules of the Road

There is a widely shared view within the CD for the need to elaborate rules of the road as a way to reduce the threat of possible incidents in space and lower the risk of misinterpretation of the activities of space objects launched by States. Such rules would not only provide better information concerning potential threats to satellites, but also discourage aggression by ensuring that the source of a potential attack would be identified.

Suggestions for the elements of such a code of conduct have included: mutual renunciation of measures that would interfere with the operations of space objects of other

[55] See the following documents presented by Canada to the CD: Working Paper Concerning CD Action on Outer Space, CD/1487, 21 January 1998; Proposal Concerning CD Action on Outer Space, CD/1569, 4 February 1999.
[56] Statements made by the US Representative to the CD, 31 August 2000; also, CD/PV. 775, 21 August 1997.
[57] For a detailed analysis of CBM proposals for outer space see, Gasparini Alves, P. (ed.), Building Confidences in Outer Space Activities: CSBMs and Earth-to-Space Monitoring, United Nations Institute for Disarmament Research (UNIDIR), University press, Cambridge,1996.

States;[58] restrictions on very low overflight by manned and unmanned spacecraft; definition of the altitude which constitutes the boundary between the upper limits of national airspace and the lower limit of outer space: specific rules for defended "keep-out" zones; and limitations on high velocity fly-bys or trailing for foreign satellites.[59]

Keep-out zones refer to zones of space through which only designated spacecraft may fly. This concept, which is designed to regulate the distance between satellites, would make it difficult or even Impossible to conceal an attack by any space object on another.

Keep-out zones would undoubtedly raise the issue of claims of sovereignty in outer space and other principles of existing international law. Suffice it to reiterate that any attempt to exclude all other satellites from specifically designated zones would be in breach of existing international law. To be acceptable, a system of advance notification for spacecraft approaching orbital locations established as keep-out zones, would have to be elaborated.[60]

V. International Space Inspectorate (ISI)

In 1988, the Soviet Union proposed the creation of an International Space Inspectorate (ISI) to verify the non-deployment of weapons of any kind in outer space.[61]

The principal element in the proposed verification system is the creation of "an international inspectorate" to conduct on-site inspection "before the space objects are launched". The envisaged scope of prohibition would include weapon systems equipped to conduct ground, air, or outer space strikes, "…irrespective of the physical principles on which they are based".[62] Certain types of ballistic missiles are excluded from verification.

Verification of undeclared launches from undeclared launching pads by means of *ad hoc* on-site inspections, advance notification of every forthcoming launch, establishment of observatories inspection also at agreed storage facilities, industrial enterprises, laboratories and testing centers.

Could the Soviet proposal for an ISI be a CBM rather than a verification mechanism of a weapons ban treaty?

VI. Information Exchanges

In 1989, France proposed the creation of an international trajectography center (UNITRACE), to be set up within the framework of an agreement on the immunity of satellites

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[58] Proposal of the Representative of the Federal Republic of Germany, CD/PV.318, 26 July 1985.
[59] Proposal of the Representative of the Federal Republic of Germany, CD/PV.345, 6 March 1986. See also in general, "Report of the Ad Hoc Committee on the Prevention of an Arms Race in Outer Space," CD/1034, 16 August 1990.
[60] Stojak, L., "Confidence-Building Measures (CBMs) for Outer Space" in, Hayes, P. (ed.), Space Power Interests , Westview Press, 1993,at 134; Beau, L., "CSBMs and Earth-to-Space Tracking: A General Overview of Existing Proposals" in, Gasparini Alves, P. (ed.), *supra*, note 51, at 65-66.
[61] "Letter Dated 17 March 1988 from the representative of the Union of Soviet Socialist Republics addressed to the President of the Conference on Disarmament, transmitting the Text of a Document entitled "Establishment of an International System of Verification of the Non-Deployment of Weapons of Any Kind in Outer Space", CD/817, 17 March 1988.
[62] CD/817, at 3.

and possibly as part of the United Nations Secretariat.[63] The membership of the Centre would be open, on a voluntary basis, to all States possessing or using satellites. Since its main objective would be clearly confined to monitoring of the trajectory of Earth-orbiting devices, France suggested that the Centre could play a key role in building up confidence amongst States. The Center's principal function would therefore be to collect data for updating registration, monitor space objects, and conduct real time calculation of space object's trajectories. While the French proposal acknowledged that the existence of a database would increase transparency, it also recognized that the nature of this data-gathering was such that the protection of technological and military information would be a serious consideration.

VII. Pre-Launch Notification

In 1993, France proposed the establishment of a regime of obligatory prior notification of launches of space objects and ballistic missiles. The regime would be managed by an International Launch Notification Centre (ILNC). States Parties to this regime would transmit in writing to the ILNC "notification of launches of space launchers carrying satellites or other space objects and ballistic missiles which they had planned". The ILNC would be attached to the United Nations. Its primary functions would be:

- to receive notifications of launches transmitted to it by States Parties before each launch;
- to receive information furnished by states on launches actually carried out;
- to manage a data bank at the disposal of the international community.

The establishment of such a regime would increase transparency, and thus security, of space activities, and help to deal with ballistic missile proliferation.

Since this proposal was made, the US and Russia have signed a MOU for the Establishment of a Joint Data Exchange Center (JDEC) in Moscow for the exchange of information derived from each side's missile launch warning systems on the launches of BM and space launch vehicles[64]. Appendix 2 to the MOU states that in the future, both Parties shall examine in the Joint Commission expanded data sharing globally, taking into account changes to the strategic situation in the world and the establishment of a multilateral regime for the exchange of notifications of launches of ballistic missiles and space launch vehicles.

The Appendices to the MOU highlight the sensitivity both parties have on confidentiality of the data recorded. Mechanisms for dealing with ambiguities or uncertainties are provided for. In addition, decisions of the Joint Commission will be mandatory and binding.

[63] CD/937 and CD/PV.570 (1989).
[64] See *supra*, Chapter 1, p. 12.

A SPACE-BASED WEAPONS BAN: REGULATION BY INTERNATIONAL TREATY

I. Treaty Format

A. General Arms Control Treaties

The concept of general and complete disarmament was a leitmotiv to emerge during the Cold War. With the realization that this goal would not be achieved, a more modest methodology was adopted by the international community. Thus multilateral or bilateral accords have been promulgated to proscribe, ameliorate or otherwise control military activities with more specificity.

Arms control agreements are of a specific character, as they encroach upon a state's sovereignty. The rational behind those agreements is mutual self-interest and the maintenance of a balance of power. Arms control agreements are also international law. As such these international obligations are subject to the basic rule *pacta sunt servanda*. This customary rule of international law means that treaties, once in force, are binding upon the parties to it and must be performed by them in good faith.[65]

Arms control agreements speak of "undertakings to prohibit, to prevent, and not to carry out" a certain type of activity. As part of international law, arms control treaties share its vulnerability, in that they usually lack any real enforcement procedure.

Compliance with arms control agreements is based on the concept of national self-interest. The more balanced and equal an arms control agreement is the more likely it will be complied with. In fact, problems in treaty compliance usually arise from either changes in national regimes which can produce a re-evaluation of national goals, and from repeated minor violations of treaty obligations, thus eroding the treaty.

The concept of self-interest can also be found in the abrogation clauses to many arms control agreements.

Arms control agreements can be subject to Agreed Statements, Common Understandings and Unilateral Statements which are largely interpretative declarations. Though reservations can also be made to international treaties, they are rare in arms control agreements, and tend to clarify not quantify.

B. A Comprehensive Space Treaty

Arguments for a comprehensive space treaty governing all uses of outer space usually rely on existing experiences in codification. Of particular importance is the Convention of the Law of the Sea, where the UN established an all-embracing legal regime for the oceans in a single document.[66] The proponents of such an approach to space law-making argue that it will result in a

[65] Vienna Convention on the Law of Treaties, Art. 26.
[66] UN Doc. A/Conf.62/122 (1982)

stable and coherent legal regime for outer space promoting international cooperation in its exploration and use.[67]

Comprehensive negotiations may however provide certain states pressing for reforms of existing space law the opportunity to reopen discussion on well agreed to basic principles of space law.[68] Other considerations also tend to discourage the movement towards comprehensive law making for outer space. The question of procedure is of high importance. It is unlikely that the relevant global conference would adopt rules of procedure reflecting the concerns of those states who are most actively involved in space activities. States, notably those most affected, may feel that comprehensive solutions and global conferences create a political environment responsive to numerical majorities.

C. A Comprehensive Space Weapons Ban

A comprehensive space weapons ban would prohibit all weapons, regardless of basing, designed to attack targets in outer space. Such a ban would protect both civilian and military space assets.

Current developments in ABM defense systems and the close relationship between ABM technology and ASAT weapons technology will prevent the US from considering any attempt at regulating activities for which they have not sufficiently carried out research, development and, in some cases, testing.[69]

A comprehensive ban would aim to eliminate all ASAT weapons, regardless of where they are based. Existing ASAT weapons would also have to be dismantled. Negotiating such a ban would necessarily have to start at the bilateral level and then could be open for multilateral endorsement. In addition, for a deployment ban to be truly effective, additional constraints would have to be placed on the development and testing of ground-based BMD systems. In view of the renewed interest in national missile defenses, this would be unacceptable to the US

Negotiations of a comprehensive space weapons ban are thus extremely unlikely to occur.

D. Space-Based Weapons Ban

Because no State has yet declared having placed weapons in space, a ban on space based weapons currently stands the greatest chance of successfully being negotiated at a multilateral level. Though the US has consistently stated in multilateral settings that it "believes that the existing outer space legal regime has served us well, and there is no need for new procedures"[70], this view is not unanimously held within government, military and scientific communities. Many individuals in these circles strongly favor keeping space as a "sanctuary" free of weapons and argue in favor of such a treaty.

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[67] See for a discussion on this point, Danilenko, G.M., "Outer Space and the Multilateral Treaty-Making Process", High Tech. L.J. 217 (1990), at 244-45.
[68] See, *infra*, section III.
[69] For a detailed analysis of technology similarities between ABM defense systems and ASAT weapons see, US. Congress, Office of Technology Assessment, Ballistic Missile Defense Technologies, OTA-ISC-254, Washington, DC: US Government Printing Office, September 1985
[70] See US statement CD/PV.775 (21 August 1997).

II. Treaty Content

A. Preamble

The provisions of the preamble are important to provide information as to the general mind frame and objectives of the parties at the time of treaty negotiation. The preamble is often used to interpret the spirit and intent of the drafters. The preamble could:

- recognize the common interest of mankind in the exploration, use and exploitation of space;
- recall and recognize that outer space is to be used for peaceful purposes;
- reaffirm the desire to avert an arms race in outer space and to explore and utilize outer space, including the Moon and other celestial bodies, for peaceful purposes;
- underline the States Parties desire to prevent an arms race in outer space and to lessen the danger to mankind of the threat of nuclear war;
- recall previous Resolutions of the United Nations General Assembly calling for the prevention of an arms race in outer space;
- recall and recognize the stabilizing role played by space activities in the pursuit of international peace and security;
- recall the Limited Test Ban Treaty of 1963, the Outer Space Treaty of 1967, the Registration Convention of 1975, the Moon Treaty of 1979;
- recognize the desire to contribute to the general realization of the purposes and principles of the Charter of the United Nations;
- recognize the desire to promote international cooperation and exchange scientific and technical information in the field of space activities for purposes not prohibited under this treaty Such a statement would address the intrinsic dual-nature of space technology;
- recognize the significant changes in the structure and content of world space activity as reflected in the increasing number of participants in space activities at all levels.

B. Purpose

To prevent the weaponization of outer space; to prevent a new round in the arms race; to maintain space for peaceful uses for the benefit of all mankind.

C. Basic obligation

Prohibit the testing, deployment or use of any space-based weapon for the destruction of objects on the earth, in the atmosphere or in outer space.

D. Definitions

Weapon: ‘any device or component of a system designed to inflict physical harm through deposition of mass and/or energy on any other object”.

This article shall not be interpreted to mean that the testing, deployment or use of other damage causing devices are approved but simply as a statement that no provision is contained in this article regarding those other damage causing devices.

E. Non-interference

Parties agree not to interfere with the following types of spacecraft which contribute to international peace and security: satellites for communications, navigation, photoreconnaissance, gathering signals intelligence, ocean surveillance, early warning satellites, weather monitoring. This list is not exhaustive and could be supplemented and updated during the reviews provided for in the Treaty.

F. Third Party Launches

Parties undertake not to launch weapons in outer space for other parties or anyone at all.

G. Extension of the ABM Treaty

Provision would have to be included extending the currently agreed upon prohibition on space-based weapons with strategic BMD capabilities, as set out in Article III of the ABM Treaty and as modified by the Protocol to the ABM Treaty.

H. International obligations

Parties undertake not to assume any international obligations which would conflict with this treaty.

I. Information exchanges

The exchange of information concerning launches, launch sites, production and testing facilities will be an essential component both to verification and confidence-building.

J. Ratification, signature, accession

The Treaty should be open to all States for signature. Any State which does not sign this Treaty before its entry into force in accordance with this article may accede to it at any time.

The Treaty should be subject to ratification by Signatory States according to their respective constitutional processes. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United States, Russia and China hereby designated as the Depositary Governments.

Treaty shall enter into force upon the deposit of instruments of ratification of five (5) Governments including the Government's which are designated as Depositaries under this Treaty.

For States whose instruments of ratification or accession are deposited subsequent to the entry into force of the Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

The Depository Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification of and accession to this Treaty, the date of its entry into force and other notices.

The Treaty shall be registered by the Depository Governments pursuant to Article 102 of the UN Charter.

K. Duration

The Treaty shall be of unlimited duration.

L. Review and amendment procedures

The treaty should be flexible and subject to review, updating and/or amendment as technology evolves and changes. Verification means provided for in the treaty should also be subject to review. Periodic reviews every 5 years should be provided for.

Amendments should be proposed by any State Party to the treaty. Amendments to be provided to the Depositary Governments for circulation to all State Parties. If one third of State Parties agree to the amendment, should convene an Amendment Conference. Conference to be held no less than 60 days after the first proposal for the amendment.

M. Withdrawal

Each State Party retains the right to with draw form the treaty if extraordinary events have occurred which jeopardized the supreme interests of a country. Notice of withdrawal shall be given 60 days in advance to all States parties and to the Depositary Governments.

N. Authentic languages

Authentic languages of the treaty are English, Russian, Chinese, French, Arabic and Spanish.

O. Reservations

This Treaty will not be subject to reservations. Any Annexes to the treaty are also not subject to reservations.

P. Verification

One of the most difficult set of provisions to draft will be those dealing with verification, compliance, consultation.

In order to ensure adequate and effective verification of a Space-Based Weapons Ban Treaty several different elements would need to be provided for:

- launch-site on-site inspection;
- challenge on-site inspection on the ground;

- on-site inspection in space;
- concepts such as PAXSAT 'A';
- national technical means ;
- others.

Q. Organization

The next question is what kind of structure should be adopted to best meet the exigencies of such a treaty. In this regard, the Soviet Proposal for the creation of an International Space Inspectorate might serve as a starting point. Another possibility would be to create a verification agency composed of the five permanent members of the Security Council plus other significant international powers such as Japan, Germany, Canada and India.

III. Merits and Demerits of the Treaty Format

Advantages of drafting a new Space-Based Weapons Ban Treaty include:

- being able to draw upon recent treaties in other areas of arms control;
- negotiating a treaty at a time when there is no apparent threat;
- having a clearer picture of the negotiating history and mindset of the drafters;
- showing the world community that space will be free of weapons;
- clarifying risk assessment for commercial activities and their investors;
- signal to the world community that countries are prepared to continue using space for peaceful purposes.

IV. Amendment of an Existing Treaty

Article XV of the Outer Space Treaty stipulates that any State Party to the Treaty may propose amendments.

Several proposals have been made to amend Article IV.[71] It is suggested that attempts to amend the Outer Space Treaty will not be successful for several reasons.

The first challenge would pertain to the appropriate negotiating forum for amending the Outer Space Treaty. Attempts to discuss amendments to Article IV of the Outer Space treaty within the Committee for the Peaceful Uses of Outer Space (COPUOS) would meet with strong objections, notably from the US.[72]

The historical value of the Outer Space Treaty as the *Magna Carta* for space activities should also not be underestimated. Psychologically and politically, States would not be eager to re-open a treaty which, as its full title implies, was destined to provide a set of Principles upon which other space treaties would be negotiated. This piecemeal approach reflects COPUOS and its Legal Subcommittee's desire not to create "anticipatory law" which might become too quickly obsolete in view of technological innovation and progress.

[71] See *supra*, Chapter 2.
[72] See statement made by the US Ambassador to the 39th Session of the United Nations General Assembly, in the Special Political Committee, Press release USUN 147 – (84), 28 November 1984.

Most importantly is the fact that even if agreement could be reached to amend article IV of the Outer Space Treaty, there is no guarantee that discussions would be limited to this specific article. In recent years, certain countries, notably from the developing world, have been challenging some of the accepted principles of space law, such as freedom of use and exploration. Amending procedures could in fact disrupt the very foundations of space law.

Although both the CD and COPUOS operate on a consensus decision-making basis, it should be recalled that in the case of the UN Principles dealing with Direct Broadcasting Satellites, consensus within COPUOS could not be reached and a vote was taken in order to submit the principles to the UN General Assembly for approval.[73] If consensus were not reached, any amendment would then only be binding upon those States Parties to the Outer Space Treaty who would agree to the changes. Without the agreement of major space-faring countries, a de-stabilizing situation could arise since not all States would be bound by the same obligations.

It should also be noted that although the UN General Assembly has on numerous occasions adopted resolutions urging countries to work towards the prevention of an arms race in outer space and urging countries to take necessary measures to control the militarization of outer space, the UN *per se* does not serve as a negotiating forum for treaty amendments. States Parties to an agreement amend treaties.

V. Protocol to an Existing Agreement

The term Protocol implies that an existing treaty is not only amended but new provisions which supplement existing ones are agreed to by the Parties.[74] The Protocol enters into force for each State Party to the Treaty accepting the amendments and supplemental clauses. Thus again, one could be faced with a situation whereby all space-faring nations are not bound by the same obligations.

VI. Advantages and Disadvantages of Different Negotiating Forums

A. Overview of Forums Involved in Space Law Making

As a result of the growing diversity of space-related activities, legal issues pertaining to outer space increasingly emerge in highly different international forums. Though COPUOS still remains the principal UN body concerned with legal questions arising from the exploration and use of outer space, space law-making has, in fact, not been limited to only one main negotiating forum.

The ITU has elaborated an extensive body of law dealing with the regulation of radio-frequency use and assignments of positions in the geostationnary orbit. Important norms governing the early notification of nuclear accidents on space objects were adopted in 1986 by the General Conference of the International Atomic Energy (IAEA).

International trade and market access issues are increasingly addressed by the World Trade Organization (WTO).

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[73] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Broadcasting, UNGA Res. 27/92, 10 December 1982.
[74] Black's Law Dictionary.

In the area of space arms control, the Conference on Disarmament, through its *ad hoc* Committee for the Prevention of an Arms Race in Outer Space (PAROS), is the main multilateral forum for discussions on this issue. Mention should also be made of the international community's efforts to control ballistic missile proliferation via the Missile Technology Control Regime (MTCR).

Both COPUOS and the CD operate by consensus based decision making. Current membership of each of these bodies is 61 and 66 respectively. No significant treaty has been negotiated in COPUOS since 1975. The *ad hoc* Committeeof the CD has made little progress since its creation in 1985.

Yet at the same time, numerous countries are adopting national legislations impacting on areas such as satellite communications, global positioning systems and remote sensing data distribution. Intergovernmental agencies such as the European Space Agency (ESA) and the European Community (EC) are also addressing these topics. Hybrid organizations such as the Committee on Earth Observation Satellites (CEOS) are adopting principles applicable to remote sensing and acting in accordance with them. Large scale cooperative space ventures such as the International Space Station (ISS) are also contributing to the legal and organizational framework of space activities. Hence, space law and regulations have and continue to develop outside the traditional UN law-making forums.

B. Role of the Conference on Disarmament (CD)

Though progress in the *ad hoc* Committee has been slow, it has nevertheless played a valuable lobbying role on behalf of the international community with a view to maintain pressure on the major space powers. It has also played an educational role by addressing the issues involved in preventing an arms race in outer space. The *ad hoc* Committee should continue to play this role.

One of the primary reasons for the inability of the *ad hoc* Committee to obtain anything close to resembling a negotiating mandate has been the refusal of the major space power to deal with issues of military uses of outer space in a multilateral forum, and to acknowledge any shortcomings in the existing legal regime.

There is no question that technology can be developed to place weapons in outer space. There is also little doubt that no State can expect to maintain a monopoly on such capabilities. The timing for the negotiation of a treaty prohibiting weapons in space might seem quite good, since at present, no State has ever claimed to have placed weapons in outer space. The biggest challenge will be convincing US policy makers of this point.

In the near future, it is unlikely that the *ad hoc* Committee will be given a mandate to negotiate any kind treaty. Thus, in order to keep the *ad hoc* Committee alive and to allow fruitful discussions to occur, the *ad hoc* Committee should pursue the elaboration of Confidence Building Measures (CBMs).

One such a CBM could be the prior notification of launches of space launchers and ballistic missiles. The US in particular could be more open to such an idea since the signing of the US-Russia Memorandum of Understanding (MOU) on Notification of Missile Launches which provides for pre and post launch notification of ballistic missiles and space launch

vehicles. The information is to be pooled in a Joint Data Exchange Center. The MOU clearly stipulates that once implemented, the Parties will seek the participation of other countries. Thus, multilateralization of such data is "built into" the MOU.

The CD could also try to achieve a working agreement on the scope of the terms such as "militarization" and "weaponization". Many States share the view that "militarization" may be taken to denote the use of space military support or enhancement systems, which do not have any capability to damage, destroy or otherwise interfere with other space objects or objects on the earth or in the atmosphere. Such support systems include satellites for communications, detection, early warning, intelligence gathering, navigation, reconnaissance and tracking.

"Weaponization" could be described as crossing the boundary between force support and force application. The latter would deal with the use of lethal or destructive force, from, to or in space.[75]

Finally, the recent Canadian proposal of appointing a Special Coordinator within the CD should also be pursued. This person should then either serve as the liaison between the CD and COPUOS or establish a mechanism allowing for the exchange of information between these two bodies.

C. Role of the Committee on the Peaceful Uses of Outer Space (COPUOS)

The General Assembly decided in its resolution 52/56 of 10 December 1997 to convene the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) in Vienna from 19-30 July 1999, under the theme "Space Benefits for Humanity in the Twenty-First Century". States participating in UNISPACE III adopted the **Space Millenium: Vienna Declaration on Space and Human Development.**

In its preamble, the Declaration also recognizes the significant changes in the structure and content of world space activity, as reflected in the increasing number of participants in space activities at all levels and the growing contribution of the private sector in the promotion and implementation of space activities.

COPUOS has recognized that it must embark on a re-evaluation of the existing body of space law, and assess if it is still adequate in regulating the space activities of States and other entities governed by the respective rules, particularly in light of the explosive growth of private commercial space activities.

It has recently taken measures to involve in particular the industries and organizations engaged in private, commercial space activities, with the purpose of reviewing and analyzing the way in which the present regulatory regime affects their present and future operations. This type of exchange would certainly contribute to improve mutual understanding of the global space market and their potential consequences for all countries looking for taking benefit of the application of space technologies.

[75] Watts, B., "The Military Use of Space: a Diagnostic Approach", http://www.csbaonline.org

At the last meeting of COPUOS in June 2001, the delegates from China and Russia made statements condemning the US national missile defense (NMD) system. In both cases, they were reminded that COPUOS was not the proper forum to discuss such issues.

Discussions within COPUOS should continue to highlight the "peaceful" aspects of space activities and the common benefits derived there from.

Both the Scientific and Technical and Legal Sub-Committees currently have agenda items of relevance to the CD. Perhaps more importantly, these sub-committees are made up of qualified individuals in the field of space activities and could no doubt contribute valuable information to the CD in areas involving dual-use technologies.

Of prime importance is the establishment of a mechanism to allow a free flow of information between COPUOS and the CD. The Office of Outer Space Affairs (OOSA) which serves as Secretariat to COPUOS could act as coordinator and point of contact for a Special Coordinator to be appointed by the CD.

At the April 2001 meeting of the Scientific and Technical Sub-committee, progress was made on the topic of proliferation and disposal of space debris. The tremendous amount of debris in the geostationary orbit was finally accepted by all members as posing a serious threat to the future use of this limited natural resource. It was pointed out that some of the debris is due to the fact that certain commercial entities exploit a satellite to the utmost thus often depleting the amount of fuel left and making de-orbiting impossible. One thought which will be considered at future meetings of the Scientific and Technical Sub-committee is the possibility of establishing penalties for commercial users who do not de-orbit satellites at the end of their lifetime. Penalties could be linked to licensing approvals.

With this recent development, it is hoped that COPUOS could establish a set of international standards and recommended practices which States would be expected to follow in the interest of preventing environmental pollution.

Calls have also been made to incorporate the current Principles applicable to nuclear power sources (NPS) into a Convention. Coupled with the space debris issue, COPUOS' role would thus highlight the environmental protection aspect of the usage of space as the province of all mankind. Yet these measures could also pave the way towards the elaboration of rules of the road.

POSSIBLE INSTITUTIONAL ARRANGEMENTS AND ROADMAPS

Though outer space is recognized as the province of all mankind, and, in theory, all states should have an equal say in its regulation, the reality of space activities dictates that there are a few states with very specific interests and concerns. A "limited group" approach to treaty negotiations could bring together those parties indispensable to a successful agreement. Once agreement is reached between this "limited group", it becomes much easier to open the treaty for signature to a larger number of countries.

It is suggested that as a first step towards prohibiting space-based weapons, a "layered" approach to negotiations be adopted with appropriate discussions held in several forums. Though constructive contributions can be made in large bodied international forums such as the CD, negotiations on issues pertaining primarily to space and security stand a greater chance of success if initiated amongst a smaller group of countries more active in space activities.

Option 1

One possible model could be that followed for nuclear test ban negotiations in the late '50s and early '60s. Discussions on this issue started within the confines of a Trilateral Test Ban Conference composed of the US, the USSR and the UK. The test ban negotiations were later transferred to a subcommittee of the Eighteen-Nation Disarmament Committee (ENDC). The Limited Test Ban Treaty is one of the few arms limitation agreements of universal applications.

A Conference of Experts to discuss banning space-based weapons could be convened. The Experts could come from the five Permanent Members of the Security Council plus Canada, Germany, Japan and India. The Conference could be held in Canada. The Group of Experts would from the on-set have a clear understanding that their work would pave the way for a treaty ultimately negotiated in the CD. Specific timetables with meetings would also need to be followed.

Option 2

Increasingly, governments (particularly the US) are dependent on the commercial space sector to provide essential services for national security purposes. Thus, national security aspects and export control restrictions are both the same aspect of an overall national policy in terms of a country's approach to space.

In view of the intrinsic dual-use nature of space technology and the growing interrelationship between commercial space activities and players on the one hand, and military activities on the other hand, an alternative model could be to initiate discussions within the G-8. The topic should not be limited to space and security but rather space in a global context. Advantages of such an approach would include having input at the very start of discussions into the question of regulations of dual-use technology, from players in the commercial side of space activities.

It is suggested that the Group of Eight (G-8) could act as a vehicle to advance issues of space and security. A Working Group or Panel of Experts could be set up to discuss a wide range of issues such as, *inter alia*, technology transfer controls, space-related incentives such as

providing launching services at favorable prices, discussions on a prohibition of space-based weapons. This would satisfy those countries who favor negotiations in a more restricted arena, yet involve key players in this field.

Nothing would prevent the group of experts from inviting individuals from non-member G-8 countries but with a particular interest in the topic. Invited countries could include China, India and Brazil. This was in fact how the Committee on Earth Observation Satellites (CEOS) was originally created. It was created in 1984 in response to a recommendation from the Panel of Experts on remote sensing from space, under the aegis of the Economic Summit of Industrialized Nations Working Group on Growth, Technology and Employment.[76]

Since its inception, CEOS membership has grown to encompass *all* the world's civil agencies responsible for Earth observation satellite programs, along with agencies that receive and process data. Some user organizations are also members. Thus, a more limited group of players having direct involvement in remote sensing are adopting international principles applicable to remote sensing and abiding by them, because all countries with a special interest are involved, norms of international law applicable to remote sensing can evolve through State practice.

In all cases, it should be remembered that any agreement reached (either bilaterally or amongst a more limited number of countries) should then be open for accession to other States.

Even such a "limited group" approach to negotiating a first ban on space-based weapons will be difficult to accept for the US The role of the multilateral arms control forum is seen as a derivative one, the content of which is or will be defined by the nature of understandings reached by the US at a bilateral level with Russia. Recent press reports indicate a softening of position by Russia vis-à-vis the US national missile defense. Promises of economic incentives are thought to be the catalyst.

In Europe, the recent joint efforts of the European Space Agency (ESA) and the European Union (EU) on a Joint Strategy for Space has placed space issues at the highest political level. European members of the G-8 would thus probably favor the use of the G-8 as a vehicle for discussing space and security.

The G-8 option also offers another important advantage. Space systems and their utilization are becoming more closely integrated in a much broader political and economic strategy. Thus formulating space strategy is the task of institutions responsible for mapping out political and economic strategy. Inclusion of China, India and Brazil assures equitable geographic representation of countries with active space programs.

It should also be noted that a US official indicated that within the framework of the Joint Data Exchange Committee, a first step towards meeting the JDEC's objective of a multilateral regime, countries from the G-8 could be asked to join the JDEC.

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[76] CEOS' goals are: (1) to optimize the benefits derived from space-based remote sensing through the cooperation of its members to provide services, policies, and products; (2) to provide assistance to members and users by acting as a focal point for the coordination of space-based remote sensing; and (3) to promote the exchange of technical information in order to encourage the compatibility of space-based remote sensing satellites. See http://www.ceos.org

The next question then becomes, where and how should these countries reach agreement. It is suggested that informal working groups first be set up to discuss security issues and space with the objective of preparing a draft treaty on the prohibition of space-based weapons.

Option 3

Another alternative would be to create a new Group of Eleven (G11). In addition to the G-8, member countries would also included China, India and Brazil. A similar approach was recently adopted when the Group of Twenty (G20) was created in 1999,[77] "as a new mechanism for informal dialogue in the framework of the Bretton Woods institutional system, to broaden the dialogue on key economic and financial policy issues among systemically significant economies and to promote cooperation to achieve stable and sustainable world growth that benefits all".

This would support those who feel that negotiation controls on space weapons can not be achieved in a body such as the CD because of its large membership, its consensus decision making process, and the non-representation of the interests of the private sector.

Option 4

The international community could step back and leave discussions pertaining to non-weaponization and banning ASAT testing to the US, Russia and China.

Any treaty negotiated by the US, Russia and China on such questions should then be opened to all States for accession. There can be little doubt that a many countries would become party to such a treaty leading eventually to the emergence of a rule of customary law binding upon all states.

Nevertheless, despite the special responsibility of the US, Russia and China in the area of space arms control, the community of nations must participate at the multilateral level in efforts to curb weapons in space.

[77] G20 Meetings and related Documents, http://www.g7.utoronto.ca

CONCLUSION

The major concerns about the potential directions of military space activities revolve around, *inter alia*, the following trends:

- proliferation of ballistic missile technology;
- proliferation of ABM systems in space;
- increasing application of space-based systems to support terrestrial combat;
- potential deployment of ASAT weapons due to the growing importance and relevance of space terrestrial operations;
- constraints on civilian uses of outer space due to military considerations.

All these issues are related and can not be resolved in isolation of each other. All have been touched upon both bilaterally between the US and Russia, but also in multilateral forums such as the MTCR, COPUOS and the CD.

No single forum and no single treaty could effectively address all of the issues that have been raised concerning military uses of outer space. A constructive approach to these issues will require a pragmatic balance between national interests and international needs/cooperation, and considerations of national security.

The world has witnessed considerable growth in the commercialization and privatization of space-related activities. This trend has led to significant increases in the number of non-state actors involved in the exploration and use of outer space, as well as the number of different activities in which they are engaged. The growing use by the military of civilian satellite systems for arms control and intelligence gathering will continue to grow.

With the Cold War behind us, the world expects to enjoy the benefits of the peaceful exploitation of space technology. It would not welcome a new round in the space race which would diminish the likehood of using space for better education, economic growth and improved quality of life around the world.

The CD may not at this point in time be the appropriate forum to initiate discussions on a treaty banning space weapons (regardless of where they are based) or a treaty banning space-based weapons outer space. A limited group of countries with active space programs should initiate the process with a view of then submitting any draft agreement to the CD for a truly multilateral approach. Canada should lead this effort.

APPENDIX I: SPACE TECHNOLOGY SUMMARY*[78]

Space Technology Summary

The military potential of space technology was perceived by both super-powers almost immediately after the advent of the space age in 1957. As early as 1958, the Soviet Union submitted a proposal to the UN General Assembly to ban the use of outer space for military purposes[79]. In 1960, President Eisenhower warned the UN General Assembly that it was faced with an urgent choice: preserving outer space for peaceful purposes and for the benefit of all mankind or transforming it into a new arena for the arms race.[80]

During the intervening 40 years, outer space has been transformed into a large and highly specialized support area for terrestrial military theaters.

Command, Control, Communications and Computers (C4)

Command, control and communications (C3) technology provides the soldier with high quality real time battlefield information and integrates space technologies into tactical applications. Effective C3 assures situational awareness and provides the ability to control terrestrial, aerospace and missile forces at all levels of command.

Critical space C3 operational functions and their enabling technologies include automated planning and collaborative decision tools, automated planning and collaborative decision tools, automated satellite operations, real-time aerospace systems integration to yield a common situational picture, integrated data fusion and wargaming, and near-real time monitoring and assessment. The increased reliance on computers have led to the more current designation of command, control communications and computers (C4).

Intelligence, Surveillance and reconnaissance (ISR)

The US Joint Vision 2020[81] depends on information superiority for almost every aspect of military activity. The combination of intelligence, surveillance and reconnaissance (ISR), together with real-time communications and information processing technologies, is its enabler.

The major goal of ISR is success through information dominance. Growing demands for more precise, finished intelligence on a broad range of defense requirements strain the resources currently available. Space-based intelligence collection capabilities have matured into powerful and reliable systems, capable of meeting a greater fraction of user requirements than before. Research and development is being pursued in a full range of technologies to enhance the collection of necessary data and to examine new ways to produce and disseminate the information.

ISR activities assist in international treaty monitoring.

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[78] Content of this Appendix is a summary of the following web sites: http://www.fas.org and http://www.spacecom.af.mil/usspace

[79] UN Doc. G.A. Verbatim Off. Rec., 13 Sess., 1st Comm. A/C.1/L.219 (1958).

[80] Senate Committee on Aeronautics & Space Sciences, "Statements by Presidents of the United States on International Cooperation in Space – A Chronology: October 1957 – August 1971, US Senate, 92nd Cong., 1st Sess., 1971, 16.

[81] Long Range Plan, US Space Command, Peterson AFB, CO

Navigation

Navigation satellites were one of the earliest military applications of space technology, and among the most useful to military forces on earth.

Space-based navigation systems provide three-dimensional positioning data and a standard timing source to military, civil and commercial users worldwide. Precision navigation and timing provide targeting and geolocation information critical to coordinated and accurate force application by any platform in any medium.

The growing importance of space-based navigation systems to a variety of non-military needs such as civil aviation and emergency management has created the need for significant upgrades and modifications to this space constellation. Thus additional civil signals separate from military signals are being added to new generation navigational satellites. Plans are being formulated in the US to conduct an architecture study for the next generation satellite navigation system, capable of meeting military and civil needs through 2030.

Early warning

Space-based satellite systems perform ballistic missile warning functions. Ballistic missile warning satellites use infrared sensors to detect heat from a rocket's engine. The systems are used not only for early warning of missile attack but also to monitor missile launches to ensure compliance with arms control and weapon testing treaties. Certain systems are capable of detecting missile launches, space launches and nuclear detonations. The primary mission of such systems is to provide tactical warning and limited assessment of ballistic missile attack.

Meteorology

Weather satellites provide vital information to military forces allowing military aircraft to avoid bad weather and enabling ground forces to take advantage of breaks in cloud cover. Weather satellites provide continuous visual and infrared imagery of cloud cover over wide areas.

Direct Military Force Application in and from Outer Space

Ballistic Missiles

A ballistic missile (BM) is a missile that has a ballistic trajectory over most of its flight path, regardless of whether or not it is a weapon-delivery vehicle. Ballistic missiles are categorized according to their range, the maximum distance measured along the surface of the earth's ellipsoid from the point of launch of a ballistic missile to the point of impact of the last element of its payload. Various schemes are used by different countries to categorize the ranges of ballistic missiles.

Ballistic missile technology involves a vehicle which is propelled into outer space by rocket engines. During its propulsion, smaller portions of the missile, re-entry vehicles, detach themselves from the vehicle and then enter into a free-fall via the pull of gravitational forces to reach the ground or sea-level. The range covered by such missiles varies from intermediate (1,000-5,500 km) to intercontinental range (more than 5,500km). Missiles exist in different basing modes: fixed and mobile, and sea-launched. Military application of such missiles were first test-validated in the late 1950's and early 1960's, hence before the drafting of any multilateral space related treaty.

A considerable portion of a missile's flight time (as much as 80%) occurs in outer space and not within the atmosphere. Regardless, ballistic missiles are not recognized as being space

weapons. The flight trajectory of a ballistic missile can be divided into four phases: boost, post-boost, midcourse and terminal.

Research and development of ballistic missile technology resembles that of civilian space launch programs. The dual-nature of this technology and the desire to control ballistic missile proliferation prompted states to adopt the Missile Technology Control Regime (MTCR).

The United States divides missiles into four range classes.

Intercontinental Ballistic Missile	ICBM	over 5500 kilometers
Intermediate-Range Ballistic Missile	IRBM	3000 to 5500 kilometers
Medium-Range Ballistic Missile	MRBM	1000 to 3000 kilometers
Short-Range Ballistic missile	SRBM	up to 1000 kilometers

The Soviet and Russian military developed a system of five range classes.

Strategic	over 1000 kilometers
Operational-Strategic	500 to 1000 kilometers
Operational	300 to 500 kilometers
Operational-Tactical	50 to 300 kilometers
Tactical	up to 50 kilometers

The 1987 Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles [INF Treaty] required elimination of all Soviet and American longer-range intermediate nuclear force (LRINF) missiles with ranges between 1,000 and 5,500 kilometers, as well as shorter-range intermediate nuclear force (SRINF) missiles with ranges between 500 and 1,000 kilometers. The MTCR initially focused on missiles with ranges greater than 300 kilometers, the range of the Soviet SCUD missile.

Delivery systems vary in their flight profile, speed of delivery, mission flexibility, autonomy, and detectability. Each of these considerations is important when planning a chemical or biological attack.

Ballistic missiles have a prescribed course that cannot be altered after the missile has burned its fuel, unless a warhead maneuvers independently of the missile or some form of terminal guidance is provided. A pure ballistic trajectory limits the effectiveness of a chemical or biological attack because, generally, the reentry speed is so high that it is difficult to distribute the agent in a diffuse cloud or with sufficient precision to ensure a release under the shear layer of the atmosphere. In addition, thermal heating upon reentry, or during release, may degrade the quality of the chemical or biological agent. US experience has shown that often less than 5 percent of a chemical or biological agent remains potent after flight and release from a ballistic missile without appropriate heat shielding.

A ballistic missile also closely follows a pre-established azimuth from launch point to target. The high speed of the ballistic missile makes it difficult to deviate too far from this azimuth, even when sub-munitions or other dispensed pellets are ejected from the missile during reentry. Consequently, if the target footprint axis is not roughly aligned with the flight azimuth, only a small portion of the target is effectively covered.

A ballistic missile has a relatively short flight time, and defenses against a ballistic missile attack are still less than completely effective, as proved in the Allied experience during the Gulf

War. However, with sufficient warning, civil defense measures can be implemented in time to protect civil populations against chemical or biological attack.

Nuclear weapons differ markedly from chemical, biological, or conventional warheads. The principal difference is the size, shape, and inertial properties of the warhead. Generally, nuclear weapons have a lower limit on their weight and diameter, which determines characteristics of the delivery system, such as its fuselage girth. Though these limits may be small, geometric considerations often influence the selection of a delivery system. Chemical and biological weapons, which are usually fluids or dry powders, can be packed into almost any available volume. Nuclear weapons cannot be retrofitted to fit the available space; however, they can be designed to fit into a variety of munitions (e.g., artillery shells).

Nuclear weapons also have a different distribution of weight within the volume they occupy. Fissile material, the core of a nuclear weapon, weighs more per unit of volume than most other materials. This high specific gravity tends to concentrate weight at certain points in the flight vehicle. Since virtually all WMD delivery systems must fly through the atmosphere during a portion of their trip to a target, a designer has to consider the aerodynamic balance of the vehicle and the required size of control system to maintain a stable flight profile while carrying these concentrations of weight. Chemical, biological, and conventional weapons all have specific gravities near 1.0 gram/cc, so these materials may be placed further from the center of gravity of the vehicle without providing large compensating control forces and moments. In some special applications, such as ballistic missile reentry vehicles and artillery shells, the designer needs to include ballasting material—essentially useless weight—to balance the inertial forces and moments of the nuclear payload.

Because nuclear weapons have a large kill radius against soft and unhardened targets, accuracy is a minor consideration in the delivery system selection as long as the targeting strategy calls for counter value attacks. Nuclear weapons destroy people and the infrastructure they occupy. They only require that the delivery system places the warhead with an accuracy of approximately 3 kilometers of a target if the weapon has a yield of 20 kilotons and to an even larger radius as the yield grows. Most un-manned delivery systems with a range of less than 500 kilometers easily meet these criteria. Often, as is the case with ballistic missiles, the quality of the control system beyond a certain performance does not materially change the accuracy of a nuclear warhead, because a large fraction of the error arises after the powered phase of the flight as the vehicle reenters the atmosphere. While this is true of chemical and biological warheads as well, with a nuclear warhead, there is less need to compensate for this error with such technologies as terminal guidance or homing reentry vehicles. To be effective, a delivery vehicle employed to spread chemical or biological agents must distribute the material in a fine cloud below a certain altitude and above the surface. It should be capable of all-weather operations and should not betray its presence to air defense assets.

Anti-satellite (ASAT) System

The term ASAT is used to describe any device capable of destroying the operational capability of satellites in earth orbit. These devices can be ground-based, air-based or space-based. Ground and air-based systems can involve: (1) the direct ascent launch of a missile carrying either a nuclear or non-nuclear warhead; (2) co-orbital devices with explosive warheads; or (3) the use of a directed-energy weapon such as a laser. Space-based systems could involve explosive space mines, conventional interceptors, kinetic energy weapons or directed energy weapons.

Kinetic energy ASATs would disable their targets by force impact rather than through explosion. An ASAT system would consist of an interceptor that is launched into approximately the same orbit as the target satellite, maneuvers close to it, and then explodes, destroying the target with a blast of metal pellets. In another system, the interceptor would destroy the target by direct collision with it. Another type of kinetic energy weapon is called the electromagnetic railgun. This weapon involves the use of electromagnetic forces to accelerate a mass which impacts the target at a great speed.

Space mines and other uses of projectile satellites as ASATs are also being investigated.

Directed energy weapons use energy itself, traveling at the speed of light to destroy a target. Essentially three types of directed energy weapons are being investigated: particle beam weapons, high energy lasers, and radio frequency weapons. Directed energy weapons project are designed to engage small, discrete targets without causing collateral damage. They have "soft kill" capability whereby sensors are blinded or electronics are disrupted by the energy these weapons emit. They also possess "hard kill" capabilities accomplished when the directed-energy penetrates the surface of an object and then causes the objects' fuel to ignite or to detonate.

Ballistic Missile Defense (BMD) System

The question of defense against a nuclear attack took on a new dimension with the development of research in the possible deployment of a ballistic missile defense (BMD). In 1983, the US launched a major research program known as the Strategic defense Initiative (SDI). This program has since been revised and in 1999, President Clinton signed into law the National Missile Defense Act (NMD) of 1999.

It is the policy of the US to deploy as soon as is technologically possible an effective NMD capable of defending the US territory against limited missile attack. It is aimed at addressing the growing danger that rogue nations may develop and field long-range missiles capable of delivering weapons of mass destruction against the US.

Four factors are identified for consideration in determining whether to deploy a limited NMD:

- the status of the NMD's technological development and testing;
- the cost effectiveness of the system;
- the nature of the threat;
- the progress in achieving US arms control objectives, including negotiating necessary amendments to the ABM Treaty.

The NMD will consist of land-based, non-nuclear missiles with a space-based detection system. More specifically, it would be composed of three elements: ground-based interceptor missiles, a battle management, command, control, and communications element; and four types of long-range sensors. All elements would work together to defend the US against incoming ballistic missile.

Ballistic missile defense systems, particularly the US NMD system, are highly controversial and have been the subject of intense debate.

Russia currently opposes the US NMD system and negotiations are underway between the US and Russia, at American initiative, aimed at modifying the ABM Treaty to allow for the US system. Russian President Putin has proposed working with the US and Europe to develop a

joint missile defense program using short and medium range missiles to destroy ballistic missiles on their was up rather than intercepting the missiles on their way down as the US plan calls for. In theory, this plan would provide for ballistic missile defense from rogue States but would be of little use against the Russian nuclear force.

Deploying a NMD system could have graver implications than the demise of the ABM Treaty. It is feared that a NMD deployment could trigger a new arms race, with significant increases in the number of ballistic missiles in the arsenals of states. Moreover, fielding such a system could cause certain countries to sell missile defense countermeasures to others countries, making it more difficult for the NMD to intercept.