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LEGAL IMPLICATIONS OF A PERMANENT MANNED PRESENCE IN SPACE

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I. OVERVIEW

Mankind is on the brink of a historic event which has no equal in human history: the continuous manned occupation of outer space. Never before have humans permanently occupied an alien environment; yet current events indicate that this epoch will begin within a decade.

During the 1960’s space habitation was characterized by, at most, two-week stays by professional American or Soviet astronaut crews. In the early 1970’s, the American Skylab program extended manned occupation of space to three month visits, separated by periods of nonhabitation. By 1981, the Soviets had demonstrated, in their Salyut program, an ability to inhabit space on a continuous basis for over six months. And, in October 1982, simultaneous manned presence in space included four astronauts in the Space Shuttle and two cosmonauts in a second long-duration Salyut mission.

There is a clear trend toward permanent habitation of the outer space environment. Space agencies in the United States, the U.S.S.R., Western Europe and Japan are currently designing permanently habitable space stations for the late 1980’s-early 1990’s time frame. These space station plans are given credence by NASA’s budgeted Space Shuttle fleet of five orbiters (each of which can carry a payload bulk equivalent to four Volkswagen vans), the Soviet Union’s Proton-derivative launcher (capable of orbiting a space station in a single launch), and by the European Space Agency’s Spacelab, which provides a comfortable shirt-sleeve environment in which a space station crew can

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1 Lenorovitz, Soviets Study Long Duration Missions, AVIATION WK. & SPACE TECHNOLOGY, Sept. 28, 1981 at 41.
work and live.\(^3\) The long range but necessarily logical result of these concepts has been identified by Princeton physics Professor Gerard K. O’Neill as numerous freeflying space stations or space colonies, each populated by thousands of persons. A NASA-funded study of O’Neill’s ideas has shown them to be feasible within the next twenty years.\(^4\)

The legal consequences of a permanent manned presence in space are momentous — as significant as the legal consequences of permanent occupation of one nation by another. It is to the nature of these legal consequences that this Article is addressed.

Legal aspects of the coming epoch of permanent space occupation can best be illustrated in the context of specific space development activities. Two such activities which are providing major impetus to permanent space habitation are (1) space manufacturing, including the deployment of large space structures, and (2) utilization of space for national defense missions. Legal aspects and consequences of each of these activities are analyzed below.

II. LEGAL IMPLICATIONS OF SPACE MANUFACTURING, INCLUDING DEPLOYMENT OF LARGE SCALE STRUCTURES

A. Relevant Physical Characteristics of Outer Space

Microgravity is the physical characteristic of outer space upon which future space manufacturing will depend. Efforts to create or simulate this physical condition at or near the surface of the earth are only partially effective. However, this condition has great utility for certain manufacturing processes. Indeed, it is already generally acknowledged that the microgravity of space allows for the manufacture of certain products at quality levels, quantities and prices which earth-based facilities can never duplicate.\(^5\)

Electrophoresis ably exemplifies the value of microgravity to an important manufacturing process. This process separates certain valuable biological materials from their host medium by passing the materials through an electric potential. Cells of different types assume different charges and can thereby be separated. When electrophoresis is attempted on earth, gravity convection forces tend to overpower all movements with the result that only minute amounts of pharmaceutically useful materials are obtained.\(^6\) In space the gravity convection forces are overcome and large quantities of critically important pharmaceuticals may be produced. Among these medicines are beta cells, interferon, epidermal growth factor products, growth hormone products, anti-

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\(^3\) *International Space Stations*, supra note 2, at 20.


trysinp products and antihemophilic products. The process has been successfully tested on Space Shuttle Mission 4, and two American firms developing the process are seeking to base the orbiting processing facility on a space station or space facility. It is anticipated that hundreds of thousands of persons will benefit from these space medicines by 1990.

The booming electronics industry can also benefit enormously from the microgravity of space. The growth of large single pure crystals, an impossibility in earth gravity, has been readily demonstrated in space. Such crystals imply dramatic reductions in size, and commensurate increases in speed, of electronic information processing hardware.

Enormous spatial volume, coupled with microgravity and near continuous exposure to sunlight, is a further physical characteristic of space with great potential benefit. This characteristic takes on an economic value through the creation of very large structures in space, up to ten kilometers in length, which may be used for the collection and transmission of solar energy to earth. The efficiency of space-based photovoltaic collectors exceeds significantly the efficiency attainable on earth. These same physical characteristics of space may be used to support national defense and scientific missions utilizing large-scale manufacturing of metal alloys with strength-to-mass ratios far exceeding those of terrestrial manufacture.

B. Legal Implications

As space manufacturing and deployment of large space structures proceed, there is a corresponding increase in the potential for conflict between the activities of various states. First, as space hardware proliferates in number and size, there is an ever growing possibility of physical collision and consequent dispute over liability for resulting damage. And, secondly, as large space structures evolve to support national defense and sensitive manufacturing or scientific missions, there is a growing likelihood that states will seek to establish sovereign zones about such structures. Recognition of national sovereignty in space is a further source of dispute.

1. Space Liability

Since 1973 the world has had in place a detailed legal process for deter-
mining liability for damage caused by space objects. This process is spelled out in the Convention on International Liability for Damage Caused by Space Objects ("Liability Convention").\(^\text{14}\) For damage to objects in space, the Liability Convention bases liability on fault.\(^\text{15}\) That is, a party state is liable for compensation to an entity damaged in space by its space activities only to the extent that the party state is negligent. If fault is shared, liability for damage is shared in proportion to fault.\(^\text{16}\)

The liable party is called the "launching state," defined as a state which launches, procures the launch or from whose territory is launched, the damage-causing space object.\(^\text{17}\) This definition of liable party creates a potential for legal dispute in cases where more than one country participates in the launching of a space object. While each nation participating in a multinational space venture has joint and several liability,\(^\text{18}\) these nations may not have a common view as to fault. This potential for dispute is aggravated by the fact that an injured party may demand all its compensation from any liable state.\(^\text{19}\)

Such disputes among "launching states" are best resolved in advance through contract and insurance. Indeed, NASA currently requires third-party liability insurance as a condition to providing space transportation services.\(^\text{20}\)

The tort covered by the Liability Convention is "damage," defined as "loss of life, personal injury or other impairment of health or loss or damage to property of states or of persons, natural or juridical, or property of international intergovernmental organizations."\(^\text{21}\) So broad a definition of damage is certain to be a source of dispute between parties to a space accident. The definition, for example, leaves open the possibility of liability for both direct and indirect damage. While damage to a space-based electrophoresis manufacturing facility is clearly compensable, it is unclear whether the lost profits of the facility’s operators, or the impaired health of persons dependent on the facility’s medicines, are also subject to compensation.

The Liability Convention provides a two-step legal procedure for resolving disputes over issues such as existence and degree of fault and extent of compensable damage. Only states may present claims for damage suffered due to space activities,\(^\text{22}\) and such claims must first be submitted through diplomatic channels to a launching state within one year following either the damage or the identification of the liable launching state.\(^\text{23}\) If diplomatic relations are not


\(^{15}\) Id., art. III at 2392.

\(^{16}\) Id., art. IV at 2393.

\(^{17}\) Id., art. I at 2392.

\(^{18}\) Id., art. V at 2394.

\(^{19}\) Id.


\(^{21}\) Liability Convention, supra note 14, art. I at 2392.

\(^{22}\) Id., art. VIII at 2395.

\(^{23}\) Id., art. X at 2396.
maintained with the launching state, the claim may be submitted to that state through a third state which does maintain diplomatic relations, or through the Secretary-General of the United Nations.\textsuperscript{24} The launching state is allowed one year from the date of claim submission in which to settle the claim through diplomatic negotiation. In the only instance to date in which the Liability Convention was invoked, that of Canada's claim on the Soviet Union for compensation for radioactive debris clean-up activities caused by the fall from orbit of Cosmos 954, diplomatic negotiations successfully resulted in a payment to Canada of over six million dollars.\textsuperscript{25}

The second step of the Liability Convention's claims procedure occurs only if the claim for damage cannot be diplomatically settled within one year after submission. This second step involves the establishment of a Claims Commission of three members with the claimant and launching states each selecting one member and jointly agreeing upon the third member.\textsuperscript{26} Where there are several claimant or launching states, there must be collective agreement by all claimant and launching state members regarding their respective representatives.\textsuperscript{27} If no agreement can be reached on the third Claims Commission member within four months, either party may ask the U.N. Secretary-General to appoint the third member.\textsuperscript{28} In the event that a state fails to appoint a member at all, the United Nations appointee would become a single-member Claims Commission.\textsuperscript{29}

The Claims Commission must determine fault and fix compensation for damage in accordance with "international law and principles of justice and equity."\textsuperscript{30} The Claims Commission's decision is binding only if the parties to the dispute so agree beforehand.\textsuperscript{31} In the absence of such an agreement, the decision is recommendatory only, but must be considered in "good faith."\textsuperscript{32} There is no ceiling on the amount of damages for which the tortfeasor state can be held liable.\textsuperscript{33}

The above-described legal process for liability problems arising from space activity is certainly a major achievement of the international legal community. It provides an agreed-upon procedure for resolving liability disputes over space resource development activity up through the limit of a recommendatory Claims Commission decision. Beyond this point, no international procedure exists for resolving liability conflicts, and no formal procedure is likely to prove viable, given the present reticence of states to cede binding enforcement jurisdiction to international institutions.\textsuperscript{34}

\textsuperscript{24} Id., art. IX at 2396.
\textsuperscript{25} See COMMUNIQUE OF THE CANADIAN DEPT. OF EXTERNAL AFFAIRS, No. 8, Jan. 23, 1979.
\textsuperscript{26} Liability Convention, supra note 14, art. XIV at 2398.
\textsuperscript{27} Id., art. XVII at 2399.
\textsuperscript{28} Id., art. XV at 2398.
\textsuperscript{29} Id., art. XVI at 2398.
\textsuperscript{30} Id., art. XII at 2397. Decisions are by majority vote. See art. XVI at 2399.
\textsuperscript{31} Id., art. XIX at 2400.
\textsuperscript{32} Id.
\textsuperscript{33} Id.
\textsuperscript{34} See generally, Vereshchetin, State Sovereignty and Use of Outer Space For Applied Pur-
Nevertheless, risks not covered by Liability Convention procedures may be covered by insurance. The rates of such “no-fault” space liability insurance will depend on the magnitude of the space activity, the risk of loss and the record of compliance by space-faring states with Claims Commission decisions, both binding and recommendatory.35

While insurance is an excellent vehicle for minimizing space liability disputes, it cannot be assumed that either adequate capacity or institutional arrangements exist for the risks involved in large-scale space industrialization. Indeed, there is at present significant uncertainty as to whether the insurance market will be able to continue existing underwriting practices for spacecraft risks.36 The basis for this concern is a substantial excess of losses paid or reserved over premiums earned.37 It may very well become necessary for governments to step in and become an insurer of last resort.38 Such government insurance, however, should probably be limited to specific large-scale projects in order to avoid undercutting the private insurance market. This was the approach taken by the United States in passing the Price-Anderson Act, which provides for government indemnification in the case of nuclear energy accidents.39 As space industrialization expands under the protection of complementary government and private insurance, risks should become more well known and controlled and the premium base for space insurance should expand. Projects previously insured under national statutes may then be within the capacity of the private insurance market and government protection can be reserved for projects at the ever-expanding frontier of space industrialization.

2. National Jurisdiction and Control in Space

An additional and more complex source of legal dispute posed by space manufacturing and large space structure deployment involves the extension of national sovereignty into space. The starting point for an analysis of national sovereignty in space must be article II 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 (“Outer Space Treaty”).40 This article states that “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.”41 This provision would appear to proscribe individual states from attempting to assert the right to exclusive use of any volume of space.42

poses, 15 SOVIET LAW AND GOV'T 75 (Fall 1976).
36 Satellite Wk., Nov. 1, 1982 at 5.
37 Id.
38 See e.g., Dembling, Catastrophic Accidents: Indemnification of Contractors Against Third Party Liability, 10 J. SPACE L. 1 (1982).
41 Id., art. II at 2413.
42 See Lachs, Some Reflections on the State of the Law of Outer Space, 9 J. SPACE L. 3, 7-9
However, the force of article II is somewhat modified by article VIII of the Outer Space Treaty. This article provides that "[a] state party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body." Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body. This article, by vesting "jurisdiction and control" of space objects in a state, implies a right to dictate access and utilization rights to portions of space occupied by national space facilities. Article XII of the Outer Space Treaty supports this point by providing that "[a]ll stations, installations, equipment and space vehicles on the moon and other celestial bodies shall be open to representatives of other States Parties to the treaty on a basis of reciprocity." First, by omitting facilities in outer space but not on the moon and other celestial bodies, article XII implies that states maintain exclusive control over access to their space facilities in orbit. Second, by conditioning access opportunities to lunar facilities on a "basis of reciprocity," there is a further implication of significant national control over portions of celestial bodies encompassed by national space facilities.

There is, therefore, an inherent dilemma in space law between the prescription of national appropriation of any volume of space and the admission of national jurisdiction and control rights for volumes of space encompassed within national space facilities. To date this dilemma has yet to cause practical legal problems because the volumes of outer space encompassed by space objects — the Salyut space stations, Skylab, communication satellites — are exceedingly small and are occupied in only a transient manner. However, by the late 1980's and in the 1990's, this picture of space occupation will change dramatically.

The resource development activities of space manufacturing and deployment of large space structures imply a permanent and growing occupation of space. Permanent space facilities are being actively considered in the United States, the Soviet Union, Canada, Western Europe and Japan. These facilities include joint plans of Fairchild Industries and NASA for a long-term multi-mission space platform on which to base space manufacturing and scientific research payloads, and a recent proposal of Mitsubishi Heavy Industries for joint U.S.-Japanese development of long duration space stations based on European Spacelab Modules. NASA has funded detailed studies of large space habitats occupying over a million cubic meters of space, to be built from mil-

(1981) for an insightful examination of the legal status of outer space and the status of orbital overflights under customary international law.

42 Outer Space Treaty, supra note 40, art. VIII at 2416.
44 Id.
46 Id., art. XII at 2418.
48 International Space Stations, supra note 2.
47 Lowndes, Fairchild, NASA Agree on Leasecraft, AVIATION WK. & SPACE TECHNOLOGY, October 18, 1982 at 14; see also Manned Orbited Space Station Studied, supra, note 2, at 57.
lions of metric tons of lunar materials.\(^4\) Also, both the U.S. and the Soviet Union are considering stationing large-scale strategic defense equipment in space.\(^5\) All these activities portend a significant potential for conflict over competing claims to overlapping regions of space.

There do not now exist any formal legal procedures to govern competing claims to exercise jurisdiction and control over volumes of space dedicated to space manufacturing and large space structure missions. For example, if the plans of two states or groups of states to deploy very large solar power satellites were to conflict, the dispute would have to be settled in an \textit{ad hoc} manner.

A start on appropriate conflict resolution procedures for large-scale space industrialization activity has, however, been made. Article IX of the Outer Space Treaty provides that:

> In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the treaty.\(^6\)

The same article further provides that:

> [I]f a State Party to the treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.\(^7\)

Finally, any state "which has reason to believe" that another state's planned space activity would "cause potentially harmful interference" with its peaceful utilization of outer space, may "request consultation concerning the activity. . . ."\(^8\)

Clearly, provisions such as these represent but the beginning of a legal process for the epoch of permanent space habitation, and their practical implementation remains to be demonstrated. It may be questioned, for instance, whether any party state will voluntarily initiate a consultation proceeding concerning its own planned activities. Disputes concerning competition between states for volumes of space which are not resolved through diplomatic negotiation will be a certain source of international tension and discord.

Disputes such as these which are not resolved through negotiation may be

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\(^4\) See generally, NASA, supra note 4.

\(^5\) See generally, Soviets Outspending U.S. on Space by $3-4 Billion, AVIATION WK. & SPACE TECHNOLOGY, July 19, 1982 at 28-29.

\(^6\) Outer Space Treaty, supra note 40, art. IX.

\(^7\) Id.

\(^8\) Id.
resolved in one of two ways. First, the parties to a dispute may resort to the principle of proportionality. Under this principle, a state may use coercion to enforce its rights, with such coercion being limited in magnitude to the threat to international peace and security to which it is responding. While such coercion need not be military in nature, and need not occur in space, it must be observed that both the United States and the Soviet Union are actively developing space weaponry. While these systems, known as ASATs, presently rely upon kinetic energy for destruction, more advanced laser and charged particle beam weapons are under development for the 1990's.83

A second, and far more preferable conflict resolution procedure would be to submit disputes over competing claims to areas of space to the International Court of Justice (ICJ). The ICJ is empowered to provide decisions on such disputes pursuant to articles 34, 35 and 36 of the Court's organic statute.84 The ICJ is an optimum forum because no court enjoys greater prestige and respect on international legal issues and the issues in question are wholly international, being grounded in both positive and customary space law.85 Furthermore, space development disputes are likely to exist for decades to come, and their future resolution will be facilitated greatly by a single source of international judicial precedent. Finally, because large-scale ventures require substantial time for realization, the conflicts to which they give rise might lend themselves to long-term resolution planning, a process which could be consistent with the ICJ's adjudicatory time frame.

III. LEGAL IMPLICATION OF UTILIZATION OF SPACE FOR NATIONAL DEFENSE MISSIONS

A. Capability of the Outer Space Environment to Serve National Defense Missions

It is beyond question that space serves as a resource for military exploitation, as well as for use by commercial interests. The high-altitude character of outer space, and the fact that it completely encircles the earth and provides the opportunity for access to any point of the globe gives rise to a natural military staging area for offensive or defensive purposes. National security provides one of the greatest sources of impetus to a permanent manned presence in space. The defense establishment can best handle the financial burden of manned space stations and can readily appreciate the contribution men make to complex space systems. Indeed the earliest budgeted long-duration manned space mission, Manned Orbiting Laboratory, was a U.S. Air Force project. Current planning in both the Soviet Union and the United States for permanent space stations contemplate such stations being dedicated either partially or to-

84 I.C.J., Acts and Documents Concerning the Organization of the Court, No. 4, Statute of the Court, arts. 34, 35, 36 (1978).
85 With regard to the Court's universality, see A. El-Erian, The International Court of Justice and the Concept of Universality, 19 COLUM. J. TRANSNAT'L L. 197 (1981).
tally to national defense missions.66

The wide line-of-sight capability offered by the high altitudes of space provides a highly beneficial means of surveillance. It has been estimated that three out of four of the more than 1,000 satellites launched by the Soviet Union in the twenty years following Sputnik were for military purposes, while 348 of the 699 satellites launched by the United States during this period similarly had military purposes.67

The evolution of satellite surveillance technology has yielded new, sophisticated verification procedures. This technology not only made possible the finalization of the U.S.-Soviet Anti-Ballistic Missile Treaty,68 but the technology was expressly recognized in and protected by the ABM Treaty as "national technical means of verification."69 Today, satellites relay approximately three-quarters of all United States military communications, while the Soviet military has reportedly established a fully redundant satellite communications system of its own. Satellites enable military ground, sea and air commanders to fix their positions accurately; they help guide missiles; they map terrain and weather patterns; and track troop movements and build-ups.60

Because of the critical role which satellites have assumed, both commercially and militarily, the military interest in space has taken the next obvious step with the development of an antisatellite capability. Starting in the late 1960's, the Soviets have pursued a long-term test program to develop antisatellite "killer" satellites, and it has been suggested that the Soviets now have the capacity to hit satellites in geosynchronous orbit.61 Beginning in 1977, the United States in response undertook development of its own antisatellite (ASAT) weapon, which will take the form of a "miniature homing device" launched either by rocket or by plane.62 Then, in 1978, the White House undertook a satellite defense program.63 The first Air Force ASAT "squadron" will reportedly be operational in 1984.64

The American government recognized the potential usefulness of space as a military resource as early as the adoption of the National Aeronautics and Space Act of 1958.65 In declaring the United States committed to devoting space activities to peaceful purposes under the administration of a civilian agency, NASA, Congress made an exception in the Act for "activities peculiar to or primarily associated with the development of weapons systems, military

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67 J. CANAN, supra note 56 at 18.
69 Id., art. XII.
70 J. CANAN, supra note 56, at 18.
71 Id. at 22.
72 See Priorities Set for Antisatellite System, AVIATION WK. & SPACE TECHNOLOGY, Sept. 3, 1979, at 57.
74 J. CANAN, supra note 56, at 19-21, 177.
operations, or the defense of the United States," which it stated were reserved to the Defense Department.\textsuperscript{66}

Speculation suggests that potential military applications of the space shuttle has fueled continued funding for that NASA project in the face of otherwise severe budget cuts for civilian agencies. A ranking Air Force general has publicly testified that "space may be viewed as an attractive arena for a show of force," since conflict there would not violate national boundaries, would involve little loss of life and would be relatively inexpensive.\textsuperscript{67} Finally, it is notable that the United States Air Force recently established a Space Command to coordinate space-related military missions,\textsuperscript{68} a clear indication that military exploitation of space is under active consideration.

One persistent, though far from dominant, school of thought on the military use of space is that mankind's political disputes might eventually be resolved by conflict in space without the widespread havoc on earth which terrestrial nuclear war would bring.\textsuperscript{69} Whether in space or on land, however, conflict resolution by use of force, as opposed to show of force, must be recognized as a failure of legal process. The discussion which follows seeks to define the bases upon which the opportunity for noncombatant procedures to resolve disputes in space can be maximized.

B. Legal Implications: The Existing Legal Regime

Existing international legal standards prohibit neither conflict in space nor use of space to support terrestrial conflict.\textsuperscript{70} The 1967 Outer Space Treaty declares that the use and exploration of space shall be conducted "in accordance with international law, including the United Nations Charter, in the interest of maintaining international peace," and provides for a "consultation" process to resolve perceived possibilities for "interference" in the use of space.\textsuperscript{71} The specific restrictions on military activity in the space segment are discrete, but important. Party states to the Outer Space Treaty are forbidden from orbiting around the earth nuclear weapons or "weapons of mass destruction," and they are prohibited from establishing military bases or fortifications, and from conducting military maneuvers on the moon or other celestial bodies.\textsuperscript{72}

Thus, the Treaty does not purport to control the establishment of travelling or orbiting manned military spacecraft. Moreover, by incorporating by reference the terms of the U.N. Charter, the Outer Space Convention endorses the applicability to the space segment of article 51 of the Charter, which recognizes each nation's right of self-defense.\textsuperscript{73} Also, since the Outer Space Treaty
provides only for avoidance of interference between the peaceful uses of outer space by party states, the entire issue of space resource development for national defense missions is unresolved. States may certainly disagree as to which space defense missions are “peaceful” in character, and states may deny other states the right to jurisdiction and control over volumes of space dedicated to “non-peaceful” purposes.\textsuperscript{74}

Additional specific restrictions on the military use of space flow from other international agreements. The Nuclear Test Ban Treaty of 1963 prohibits testing in space of nuclear weapons.\textsuperscript{75} The ABM Treaty protects the satellites of the two signatory powers from “interference” by the other side, and prohibits the introduction of ABM technology into space.\textsuperscript{76} The 1977 Convention on Environmental Modification Techniques prohibits hostile long-lasting environmental modification techniques being employed in outer space.\textsuperscript{77}

Recent advances in space capability of the Soviet Union and the United States, in addition to the continuing escalation of the arms race between the two superpowers, have heightened concern regarding the adequacy of international legal standards governing military use of space. Such concern has rekindled a movement to promote international negotiations to prohibit the extension of the arms race to outer space.

This movement is gaining momentum in the United States, and already has garnered support on Capital Hill. In this regard, various resolutions have recently been introduced in the United States Senate and House of Representatives, calling for the President to resume talks with the Soviet Union for the purpose of negotiating an agreement prohibiting the use of weapons in space. While some resolutions have called for the ban of only specific types of weapons (Senate Resolution 43 focuses on the prohibition of antisatellite weapons as a first step),\textsuperscript{78} others call for a comprehensive ban on weapons of any kind in space.\textsuperscript{79}

\section*{C. Legal Implications: Potential Scenarios}

The ability of law to control or discourage military conflict in space rests, as will be shown below, on limited footings. In the following survey of potential military conflicts in space, analysis of such existing shortcomings will be pro-


\textsuperscript{76} ABM Treaty, supra note 58, arts. V, XII.


\textsuperscript{78} S. Res. 43, 98th Congress, 1st Session, February 2, 1983. \textit{See also} S. Res. 129, 97th Congress, 1st Session, May 6, 1981.

vided, and possible amendment to governing legal standards suggested toward the end of effectuating meaningful noncombatant procedural responses. It is important to observe in this connection that the existing legal regime does not distinguish between manned and unmanned use of space.

1. Attack on Space Objects

A physical attack on a manned or unmanned space object, whether effected by terrestrial or space means, would clearly constitute an act of aggression justifying the attacked country to respond in kind, or to seek alternative political, economic, diplomatic and legal recourses. This result follows from the preservation of "jurisdiction and control" by the state on whose registry the space object is listed under article VIII of the Outer Space Treaty, and on the presumed reservation of the right of self-defense under article III of that Treaty, as discussed above. As stated by Professor Almond:

General principles of law with respect to [peaceful uses of] outer space . . . do not restrain states from providing for their own self defense, or using force to protect their space objects if they are attacked, and, more particularly they do not deny them measures of military preparedness consistent with an advancing military technology.

In the case of encounters between the Soviet Union and United States, this analysis is underscored with regard to surveillance satellites by the provision in the ABM Treaty recognizing and protecting the role of "national verification" means. Where an armed act of aggression occurs on a privately owned space object, such as a space operation center owned by a consortium of private firms, it may be inferred that the state of registry can consider the attack to be upon itself since it retains "jurisdiction and control" of the vehicle under the Outer Space Treaty.

2. Violations of Established International Legal Standards

Of greater probability is the occurrence of some activity in the space segment short of an outright attack on another nation's property, but which is perceived as a threat to peace. Possible examples would be the placement of nuclear weapons or weapons of mass destruction in orbit around the earth or the conduct of military maneuvers or weapons testing on the moon or other celestial bodies, both in violation of the specific terms of the Outer Space Treaty.

The first salient concern in this regard is that of verification of compliance or, more aptly put, identification of violations. As discussed above, the Outer Space Treaty has attempted to establish rudimentary legal procedures, some of which speak to the practical concern of verification with dubious effectiveness. Party states to the Treaty have an obligation to report to the Secretary-Gen-

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80 Almond, supra note 70, at 2.
81 Id.
82 Outer Space Treaty, supra note 40, art. VIII.
eral of the U.N., as well as to the "public and international scientific community, to the greatest extent feasible and practicable," on the nature, conduct, location and results of all activities in space or on the moon or other celestial bodies.\textsuperscript{83} The effectiveness of such an "honor system" for compliance with the terms of the Treaty has above been critically questioned.\textsuperscript{84}

The Outer Space Treaty also provides in article X for state parties, in furthering the purposes of the Treaty, to "consider on a basis of equality" any requests by other state parties to observe the "flight" of its space objects. This provision was designed as a sort of most-favored-nation satellite tracking covenant.\textsuperscript{85} The obvious shortcomings of this provision is the fact that it does not require cooperation, but only mandates that such cooperation be considered. Article XII requires that all "installations, equipment and space vehicles located on the moon and other celestial bodies be open for inspection by other party states on a basis of reciprocity."\textsuperscript{86} This on-site verification proviso represents a mandatory and, thus, more effective on-site verification approach than reflected in the previously discussed paragraph. However, no on-site inspection is required for orbiting space objects, and the concept of "reciprocity" may work to qualify materially the provision's effectiveness. More effective verification could be secured by extending the approach of article XII to encompass verification anywhere in the space domain. In that manner, a party state capable and willing to undertake verification would have meaningful opportunity to publicize the results of its findings to the international community, thereby identifying a breach of international legal responsibility as the first step toward resolution of that conflict.

Assuming that Treaty violations can be identified, a separate problem of effective response to such violation exists. Under the Treaty, no sanctions are provided against parties for violations. Efforts by both the United States and the Soviet Union to incorporate such provisions in the final text failed.\textsuperscript{87} The only existing provision bearing on dispute resolution is found in article IX, discussed above, which authorizes a party state to request "consultation" with any other party state whose actions are deemed to cause "potentially harmful interference with exploration and use of outer space." The consultation provision does not look to the resolution of conflict arising from threats to a state's security, but instead only to obstacles to the peaceful exploration and use of space.

In order to establish a meaningful dispute settlement procedure for the situation described, an understanding should be reached that the "consultation" process may be utilized for any properly identified violation of the Convention. In this connection, more effective use of the consultation process might be achievable if an "appellate" procedure was established permitting an

\textsuperscript{83} Outer Space Treaty, supra note 40, art. XI.
\textsuperscript{84} See supra notes 52-53 and accompanying text.
\textsuperscript{86} Outer Space Treaty, supra note 40, art. XII.
\textsuperscript{87} Dembling & Arons, supra note 85, at 453.
unsatisfied complaining party, after consultation, to seek relief in the United Nations or, perhaps, the International Court of Justice through a binding jurisdiction provision.

3. Assertion of Sovereignty

Another foreseeable form of conflict could erupt as a result of a state asserting a “zone of security” around a space habitat or space platform. With the introduction of a manned presence in space, the likelihood of efforts to establish such “zones” will increase. Depending on its extent, this space-age form of territorial claim could plausibly cause interference with the space objects of other nations whose orbits might come close to that of the protected object. At the least, adequate grounds would exist to raise suspicion as to the mission of the vehicle surrounded by the protective zone. For example, during Space Shuttle Mission 5, the Soviet Salyut space station passed, at one time, within 20 kilometers of the orbiter Columbia — close enough for direct visual contact.

The establishment of such a zone could be a proper subject of the consultation procedure in article IX of the Outer Space Treaty if a complaining state were able to demonstrate that its exploration or use of space was interfered with by the creation of the zone. Certainly, this argument would take on greater credence if numerous states adopted the “zone” concept as the number of space habitats and space platforms increased.

More probably, however, it could be argued that the zone violated the Outer Space Treaty in at least two ways. First, it would constitute an illegal assertion of sovereignty over a segment of space in violation of article II. Establishment of the zone, however, might be justified on the ground that it constitutes a pre-emptive form of “self defense.” The second possible violation would be of the party state’s obligation under article X to “consider” requests to “observe the flight” of its protected vehicle. Unless adequate observation could be made from outside the zone, the state would have to consider allowing penetration of the zone for flight observation purposes in order to comply with the Treaty.

Assuming that either of these two arguments is to be made, the interpretive problem would initially be faced as to whether such alleged Treaty violations are the proper subjects for consultation. In order for a viable dispute settlement procedure to emerge, such an interpretation or gloss should be given to the consultation article.

CONCLUSION

Clearly, the epoch of permanent habitation of outer space is at hand. Equally clear is that mankind’s move into the high frontier will be accompanied by a host of legal issues, questions and dilemmas. The task of the international space law community is to provide a legal framework that allows space industrialization to occur in a context of internationally agreed-upon rights and obligations. The manned use of space for military purposes, on the other hand, would appear to be a proper object for express legal restrictions at this point in history.
This Article has shown that a substantial start has been made in developing the legal regime which will govern permanent manned activity in space. In the area of space manufacturing, including deployment of large space structures, existing space treaties provide an initial legal framework for the exercise of national jurisdiction and control and for the resolution of liability questions arising from activities in outer space. With regard to the utilization of space for military purposes, existing space treaties provide only general guidance as to permissible national defense missions.

As space manufacturing and national defense missions continue to generate requirements for a permanent manned presence in space, the existing legal regime will soon give rise to more legal questions than it solves. Questions relating to enforcement of space liability claims, zones of jurisdiction and control around space habitats and space-based directed energy weapons hover at the frontier of international space law. And, in less time from now than has transpired since man first physically broached the space environment, fundamental questions will arise regarding the legal rights of permanent space habitat residents to order their own affairs and to generate their own law.

Hence, the legal implications of a permanent manned presence in space extend from the practical concerns of liability for damage to the philosophical underpinnings governing man's choice of governance. In no area of human endeavor are the legal implications so diverse; in no arena of human accomplishment are the legal challenges so profound.

It must be recalled that "international law is a social process by which values are created. . . . [A]nd which, through a balancing of interests, . . . further[s] the goals of predictability and stability." 68 The need for predictability and stability is supreme in space, an environment in which man can survive only by the grace of his technology. While international law can provide a predictable and stable framework for space activity, this can only be achieved through tireless efforts to reach consensus on values. Certainly the interests to be balanced are vital and not ones which can be easily compromised.

The scientific community is about to open the door to an epoch in which humans permanently occupy the outer space environment. The benefits to humanity of this new epoch depend on the efforts of the international legal community. Failure to achieve consensus or unwise balancing of vital interests will render space activity risky, unpredictable and generally unattractive except for military applications. The promulgation of a practical international legal regime which recognizes and provides for the interests of all parties interested in space development will ensure that a maximum level of enjoyment will flow from man's conquest of space. While international space lawmakers clearly shoulder an awesome responsibility, they also enjoy a powerful opportunity. The opportunity, which has come but once in history, is to blueprint the rights and obligations of countless generations of inhabitants in the limitless frontier of space.