THE ROLE OF COMMERCIAL DEVELOPMENT IN PREVENTING WAR IN OUTER SPACE*

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For almost as long as human beings have been making use of outer space, human beings have been arguing over how that use should be regulated.[1] Now, with the routinization of space activity that has accompanied the development of the space shuttle, such disputes are likely to become more frequent and more strident. Unfortunately, the arguments to date have had something of a "little red hen" flavor, with far more concern being evinced over the distribution of the proceeds of space development than over how such development should be encouraged.

This problem has been exacerbated by a series of misguided proposals intended to promote the demilitarization of space. While demilitarization is a laudable goal, these proposals share a fatal flaw: they would make space development too costly.[2] The restrictions embodied in these proposals would thus

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[1]References to the regulation of military and commercial activities in space date from a 1958 United Nations General Assembly Resolution. U.N. Resolution 1348 (Outer Space Resolution) G.A. Res. 1348, 13 U.N. G.A.O.R., Supp. (No. 18) 5, U.N. Doc. A/4009 (1958) (expressed desire "to avoid the extension of present national rivalries into" space, and established the Committee on Peaceful Use of Outer Space (COPUOS)). *See also* notes 4 and 11, *infra.*

[2]*See* note 31 and accompanying text, *infra. See also* Dula, *Regulation of Private Commercial Space Activities,* 23 JURIMETRICS J. 156 (1983).

effectively eliminate the commercial development of the most promising and vast array of resources imaginable. This would be a tragedy not only for mankind as a whole, but especially for the developing nations, for whom access to resources is particularly critical.

Commentators concerned with both military and commercial space activities have overlooked the crucial relationship between the two sets of activities.[3] We argue that the best way to keep space from becoming a barren battlefield is to promote its commercial development. While the elimination of all military activity from space is perhaps a worthwhile ideal, it is unlikely to carry the day. Consequently, we propose a set of guidelines intended to foster the development of a peaceful international regime in outer space. These guidelines are intended to embody the goals of the international community regarding outer space, as reflected in various agreements and pronouncements made to date. Such goals represent the proper starting point for any regime governing activities in space.

EXISTING INTERNATIONAL AGREEMENTS

Existing treaties involving space activities, while important, do not provide an adequate framework for a stable space regime. However, these treaties do provide some indication of the major goals of the nations involved in space endeavors. Accordingly, a short survey of existing international agreements is appropriate.

While the special conditions and circumstances peculiar to outer space pose unique problems, an examination of the current outer space order should nonetheless begin with the most basic principle of international law: non-aggression.[4]

The non-aggression principle is embodied in Article 2(4) of the United Nations Charter,[5] which prohibits the "threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations."[6] President Carter, in remarks made on June 20, 1978, declared that the destruction of an American satellite by a foreign nation would be viewed as an aggressive act and a violation of the

[3]Most who have written on international relations in space concern themselves with either military or commercial activities, but not both. *See, e.g.*, E. Jaksetic, *The Peaceful Uses of Outer Space: Soviet Views*, 28 AM. U.L. REV. 483 (1979); D. Deudney, *Unlocking Space*, FOREIGN POLICY No. 53, at 91 (Winter, 1983-84); N. Wulf, *Arms Control—Outer Space*, 11 J. SPACE L. 67 (1982); M. VAZQUEZ, COSMIC INTERNATIONAL LAW (Malley trans. 1965). *But see* MATTE, SPACE POLICY AND PROGRAMMES TODAY AND TOMORROW: THE VANISHING DUOPOLE 87 *et seq.* (1980).

[4]*See* International Co-operation in the Use of Outer Space for Peaceful Purposes, G.A. Res. 1721, 16 U.N. G.A.O.R., Supp. (No. 17), U.N. Doc. A/5100 (1961) (international law and principles of U.N. Charter should apply to outer space). *Cf.* Gorove, *Current Issues of Space Law Before the United Nations*, 11 J. SPACE L. 5 (1983), and O. OGUNBANWO, INTERNATIONAL LAW AND OUTER SPACE ACTIVITIES 25 (1975).

[5]U.N. Charter art. 2, para. 4.

[6]*Id.*

provisions of Article 2(4).[7] This view seems generally accepted;[8] it reflects the intuitive similarity between the destruction of foreign satellites and the destruction of foreign ships or aircraft. Whether the mere installation of antisatellite systems would be viewed as a violation of the above provision is, however, less clear. Certainly the presence of warships and military aircraft in areas beyond the borders of any nation is not generally so regarded.[9] However, the unique qualities of the outer space environment render simplistic analogies to earthbound law questionable.[10]

As a result, spacefaring nations have adopted a series of treaties devoted

[7]14 WEEKLY COMP. PRES. DOC. 1135, 1136 (June 20, 1978).

[8]*See, e.g.*, Jaksetic, *supra* note 3. *Contra, see* Note, *National Sovereignty of Outer Space*, 74 HARV. L. REV. 1154, 1174 (1961) (Soviet attack on U.S. satellite legitimate exercise of sovereignty over space and not act of war). This early view has been largely superseded, however. *See, e.g.*, S. BHATT, STUDIES IN AEROSPACE LAW FROM COMPETITION TO COOPERATION 92 (1974), and Note, *The Legality of Antisatellites*, 3 B.C. INT. & COMP. L. REV. 467 (1980). *Cf.* Akehurst, *Custom as a Source of International Law*, 1974-75 BRIT. Y.B. INT'L L. 1 (1977). These commentators argue that since no nation has seriously challenged the right of other nations to orbit satellites above its territory, the right to do so without interference has become a part of customary international law. However, the equatorial nations, in a statement generally referred to as the Declaration of Bogota (December 3, 1976), declared that geosynchronous orbital positions are part of the sovereign territory of the nation over which they are located. For text *see* 6 J. SPACE L. 169 (1978). This declaration was criticized in Rosenfeld, *Where Air Space Ends and Outer Space Begins*, 7 J. SPACE L. 137, 142 (1979). As early as 1963, McDougal, Lasswell, and Vlasic noted that most declarations of sovereignty over outer space would be improper and damaging to the maintenance of international order. MCDOUGAL, LASSWELL & VLASIC, LAW AND PUBLIC ORDER IN SPACE 276-288 (1963) (vast preponderance of uses of outer space should be "inclusive" in nature (*i.e.*, non-sovereign), although occasionally "exclusive" claims may be recognized, especially where they enhance a vital security interest that affects a wide community of nations). This view has been consistently followed in the literature. *See, e.g.*, VAZQUEZ, *supra* note 3, at 42; Halket, *et al.*, *Report on the Proposed Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 23 JURIMETRICS J. 259, 265-268 (1983). *And see* Dula, *Free Enterprise and the Moon Treaty*, 2 HOUSTON J. INT'L L. 3, 21 (1980) (proposed moon treaty would inhibit free enterprise in space).

[9]For an excellent discussion of the problem of what constitutes the peaceful use of outer space, see D. Goedhuis, *Some Observations On the Efforts to Prevent a Military Escalation In Outer Space*, 10 J. SPACE L. 13,16-18 (1982). *See also* Menter, *Peaceful Uses of Outer Space and National Security*, 17 INT'L LAW. 581, 582 (1983) ("Thus . . . states, if desired, may undertake military readiness in outer space analogous to having armed naval vessels on and armed aircraft on alert in flight over international waters. Such military activities extending into outer space must be in the interests of maintaining international peace and security. While aggressive action is precluded, the right of self-defense may be exercised by a state in response to 'imminent' armed attack under Article 51 of the U.N. Charter." [footnote omitted]).

[10]*Cf.* Dekanozov, *Relationship Between the Status of Outer Space and the Statuses of Areas Withdrawn From State Sovereignty*, INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION, PROCEEDINGS OF THE SIXTEENTH COLLOQUIUM OF THE LAW OF OUTER SPACE 9 (1974). (Unique circumstances of space make its legal order similarly unique.) *Contra*, MCDOUGAL, LASSWELL & VLASIC, LAW AND PUBLIC ORDER IN SPACE 819-828 (1963). ("Spatial extension resources" of outer space analogized to oceans and Antarctica.) On the similarities between outer space and the international agreements that govern cooperative activities on the continent of Antarctica, *cf.* E. Rostow, The Task Ahead, Remarks Before the Space Symposium sponsored by the United States Arms Control and Disarmament Agency, Sept. 23, 1982. An example of a declaration of principles of law relating to activities in outer space (one

exclusively to relationships in outer space. In addition, a number of more general—and thus perhaps less meaningful—resolutions and declarations have been promulgated since 1958.[11] As these resolutions and declarations have generally been of limited influence, except where they have been incorporated in subsequently adopted international agreements, our discussion will be centered primarily upon those agreements ratified by the major spacegoing powers.[12]

The first treaty to explicitly regulate space activities was the Treaty Banning Weapons Tests in the Atmosphere, in Outer Space, and Under Water,[13] which was adopted in 1963. This treaty prohibits the peacetime detonation of nuclear weapons in, *inter alia*, outer space and the upper atmosphere.[14]

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notable for its lack of impact) was the so-called Declaration of Bogota, in which equatorial nations declared sovereignty over geosynchronous orbits located above their territory.

[11]U.N. Resolution 1348 ("Outer Space Resolution") G.A. Res. 1348, 13 U.N. G.A.O.R. Supp. (No. 18) 5, U.N. Doc. A/4009 (1958) [expressed desire "to avoid the extension of present national rivalries into" space, and established the Committee on Peaceful Use of Outer Space (COPUOS)]. The most significant subsequent General Assembly resolution was the Declaration of Legal Principles Governing the Activities of States in the Exploration of Outer Space, G.A. Res. 1962, 18 U.N. G.A.O.R., Supp. (No. 15), U.N. Doc. A/5515 (1963); this was one of several resolutions that were adopted throughout the 1960s, and were incorporated into the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective Oct. 10, 1967) [hereinafter referred to as the Outer Space Treaty]. The Outer Space Treaty is the principal source of international law in space. *See Hearings Before the Subcomm. on Space Science and Applications of the House Comm. on Science and Technology*, 94th Cong., 2d Sess. 3 (1976) (statement of Carl Christol). On incorporation, *see* Menter, *Peaceful Uses of Outer Space and National Security*, 17 INT'L LAW. 581, 582 (1983).

[12]*I.e.*, the United States, the Soviet Union, and to a lesser degree the European Community, Japan, China, and India. While other nations are likely to develop spacegoing capabilities in the relatively near future, their impact on the development of the international law of outer space is likely to be limited for some time. *See* Deudney, *supra* note 3. There are, however, important reasons to encourage the participation of all nations in space enterprises; *see* discussion and notes, *infra*, under "Encouragement of LDC Participation." There are three treaties in addition to those we discuss that are important to space activities: (1) Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space (the "Agreement on Rescue and Return"), April 22, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119 (entered into force with respect to the U.S., December 3, 1968); (2) Convention on International Liability for Damage Caused by Space Objects ("Convention on Liability"), opened for signature March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 (entered into force with respect to the U.S. on October 9, 1973); (3) Convention on Registration of Objects Launched into Outer Space (Convention on Registration), January 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8480 (entered into force with respect to the U.S., September 15, 1976). While these treaties are essential to space activities, they are largely technical documents that shed little additional light on the fundamental goals of their signatories. For a helpful discussion of these three agreements, *see* Christol, *Inventory of Space Activities: Legal Aspects*, in SPACE ACTIVITIES AND IMPLICATIONS: WHERE FROM AND WHERE TO AT THE THRESHOLD OF THE 80's 69 (N. Matte ed. 1980). On the Rescue and Return Treaty, *see also* Dembling and Arons, *The Treaty on Rescue and Return of Astronauts and Space Objects*, 9 WM. & MARY L. REV. 630 (1968).

[13]August 5, 1963, 14 U.S.T. 1313, T.I.A.S. 5433, 480 U.N.T.S. 43 (effective October 10, 1963). (Test Ban Treaty) *See* GOROVE, STUDIES IN SPACE LAW: ITS CHALLENGES AND PROSPECTS 155 *et seq.* (1977).

[14]The treaty does not prohibit nuclear testing in wartime. Also, several nuclear states with space capabilities are not parties to that treaty. *See* GOROVE, *id.*

The second, and by far the most important,[15] of the space treaties is the Outer Space Treaty of 1967.[16] The most salient provision of this treaty is Article IV, which reads:

(1) States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.

(2) The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited.[17]

A third treaty of significance is the Accident Measures Agreement,[18] which, in conjunction with the Prevention of Nuclear War Agreement,[19] obliges the United States and the Soviet Union to refrain from interference with the attack early-warning systems of the other side, including space satellites.[20] Although some commentators[21] question the stability-enhancing nature of such systems, these agreements, together with the important role such systems played in containing the Cuban Missile Crisis, argue strongly for excluding early-warning and surveillance satellites from the arena of conflict in future crises.[22]

Another treaty with implications for space activities is the treaty between the United States and the Soviet Union entitled the Treaty on the Limitation of

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[15]Commentators have long sung the praises of the Outer Space Treaty. "It is clear that the Outer Space Treaty is one of the most creative and fruitful modern acts of lawmaking, outlining a bold vision of the international law for outer space, a constitutional Grand Design which would encourage the advance of knowledge and the peaceful use of outer space, and at the same time prevent its exploitation for purposes of aggression." E. Rostow, *supra* note 10, at 1.

[16]*Supra*, note 11.

[17]*Id.* For discussion of the scope of this provision, see Note, *Legality of Antisatellites*, *supra* note 8, and GOROVE, *supra* note 13.

[18]Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War, September 30, 1971, 22 U.S.T. 1590, T.I.A.S. 7186, 807 U.N.T.S. 57 (effective Sept. 30, 1971).

[19]Agreement on the Prevention of Nuclear War, June 22, 1973, 24 U.S.T. 1478, T.I.A.S. 7654 (effective June 22, 1973). *See generally* Menter, *supra* note 11.

[20]The importance of such systems, and the likelihood that their destruction would presage a major assault by one power on the other, is shown in a book by General Sir John Hackett in which he describes a hypothetical world war between the United States and the Soviet Union. Hackett, a former commander of NATO, describes such a war as being kicked off by a Soviet attack on American communication and reconnaissance satellites. J. HACKETT, THE THIRD WORLD WAR: AUGUST, 1985 (1982). Western peoples should hope that things go as well for NATO in the event of an actual war as they do in Hackett's book.

[21]Deudney, *supra* note 3.

[22]*See* D. RITCHIE, SPACEWAR 79-80 (1983); *see also* G. ALLISON, ESSENCE OF DECISION: EXPLAINING THE CUBAN MISSILE CRISIS 192-194 (1971). Also, in connection with war avoidance, the United States and the Soviet Union have pledged to make every effort to ensure the reliability of the emergency satellite link between the two (the so-called Hot Line). Agreement on Measures to Improve the Direct Communications Link, Sept. 30, 1971, 22 U.S.T. 1598, T.I.A.S. 7187 (1971).

Anti-Ballistic Missile Systems.[23] This agreement prohibits the development, testing, and deployment of antimissile weapon systems on the earth and in space.[24] It has been suggested that some of the proposals made by President Reagan in his so-called Star Wars address, if enacted, would violate this treaty.[25]

The SALT I Treaty,[26] signed in 1972, required the United States and the Soviet Union to refrain from interfering with each other's "national technical means of verification."[27] Reconnaissance satellites were among the means contemplated by the treaty.

The next treaty of significance to this analysis is the proposed Moon Treaty.[28] The Moon Treaty has yet to be ratified by the United States. However, it includes limitations on the use of the moon and other planets for military purposes. It is comparable in this respect to the Outer Space Treaty, although somewhat more far-reaching in scope. The Moon Treaty differs, however, from the Space Treaty in that its "Common Heritage" provisions—similar to those in the controversial Law of the Sea Treaty—have aroused fears that its ratification would severely limit if not prohibit private commercial space ventures. It would not be unfair to say that the Moon Treaty discussion has centered around carving up the space-resources pie, rather than making it bigger. Such an approach is likely to result in more debate than development, if the Law of the Sea Treaty is any example.

Finally, the most recent arms-limitation agreement with regard to space activities is the Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space.[29] As its name suggests, this agreement would prohibit the stationing of weapons of any kind in orbit or on celestial bodies, as

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[23]May 26, 1972, 23 U.S.T. 3435, T.I.A.S. 7503 (effective October 3, 1972).

[24]*Id. See also* Goedhuis, *supra* note 9, at 15.

[25]*See* Bowman, *Star Wars—Pie in the Sky*, New York Times, December 14, 1983, at 28, col. 2. *Cf.* Deudney, *supra* note 3.

[26]Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms, with Protocol (SALT I) with Agreed Interpretations, Common Understandings, and Unilateral Statements, 23 U.S.T. 3462, T.I.A.S. 7504 (effective October 3, 1972; expired).

[27]*Id.* at Article V(2). It is noteworthy that with the inclusion of the "national technical means" language in Salt I, the Soviets tacitly put to rest their contention, made sporadically throughout the 1960's, that surveillance and reconnaisance satellites in orbit over the Soviet Union were in violation of international law. *See* STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE, OUTER SPACE—BATTLEFIELD OF THE FUTURE? 2 (1978). *See also* Hopkins, *Legal Implications of Remote Sensing of Earth Resources by Satellite*, 78 MIL. L. REV. 57, 88 (1977), *cited in* Jaksetic, *supra* note 3.

[28]Draft Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty), 18 Int'l Legal Materials 1434, 34 U.N. G.A.O.R., Supp. (No. 20) 33, U.N. Doc. A/AC.105/240 (1979) (opened for signature December 18, 1979). For U.S. consideration of the Moon Treaty, see SENATE COMM. ON COMMERCE, SCIENCE, AND TRANSPORTATION, AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES, 96th Cong., 2d sess. 271 (Comm. Print 1980). U.S. ratification of the treaty is considered unlikely by some commentators. *See* Halket, *et al.*, *supra* note 8.

[29]Proposed in U.N. Gen. Ass. Doc. A/RES/36/97 (15 Jan. 1982) 3-5. Text is reproduced at 10 J. SPACE L. 27-29 (1982).

well as banning any interference with the operations or trajectories of other parties' spacecraft. Note that this agreement, if adopted, would ban the Soviet Union's antisatellite weapon, which is stationed in orbit even in peacetime, but would not prohibit the production and deployment of the United States' proposed antisatellite weapon, which is launched from a high-flying aircraft. (*See* note 33, *infra*.) Indeed, since the treaty only prohibits interference with the spacecraft of *other* parties, it would not even prohibit the operational testing of the U.S. system so long as the targets were all U.S. spacecraft.[30]

As the preceding demonstrates, rapidly evolving technologies are likely to frustrate the efforts of negotiators and draftsmen of outer space arms-limitation agreements. Consequently, the most effective agreements to date have been those that are more concerned with the effects of technologies rather than the technologies themselves. A good example of this approach is the Outer Space Treaty of 1967; this is generally considered by scholars to be the most efficacious arms-control agreement in history.[31] Rather than focusing on specific technologies, the Outer Space Treaty bans "weapons of mass destruction," a category at once inclusive and flexible.[32] This approach seems eminently sensible. We shall therefore avoid discussions of particular technologies except as they relate to important policy issues.[33] Instead, we direct our attention to an examination of extant and proposed agreements relating to space, in an attempt

[30]The proposed text is thus unlikely to win rapid acceptance by Soviet negotiators. Any final form that may be adopted can be expected to differ somewhat in this respect.

[31]*See, e.g.*, Rostow, *supra* note 10.

[32]*See* Note, *The Legality of Antisatellites, supra* note 8, at 478–79, for a discussion of what constitutes "weapons of mass destruction." Since so-called "hunter-killer" antisatellite satellites are intended to destroy only one space-based target, they are thought by some commentators not to fall within the category of weapons prohibited by the Outer Space Treaty. *See* Deudney, *supra* note 3, at 105 [antisatellite weapons represent "an important loophole" in the present outer space arms-control regime]; D. GRAHAM, HIGH FRONTIER: A NEW NATIONAL STRATEGY 104–105 (1982) (space-based anti-missile systems would not violate outer space treaties).

[33]There are a number of good sources that discuss the technologies of space warfare. For a solid introduction aimed at the lay person, see J. DUNNIGAN, HOW TO MAKE WAR: A COMPREHENSIVE GUIDE TO MODERN WARFARE, 257–265 (1983). For a more comprehensive treatment, *see* M. Collins, *et al.*, *Inventory of Space Activities*, in SPACE ACTIVITIES AND IMPLICATIONS: WHERE FROM AND WHERE TO AT THE THRESHOLD OF THE 80's (Matte ed. 1981). For a discussion of Soviet doctrines and capabilities, *see* DEPT. OF THE AIR FORCE, Pamphlet No. 200–21, SOVIET AEROSPACE HANDBOOK (1978). For a detailed analysis aimed at the general public, see D. RITCHIE, *supra* note 22. For an in-depth proposal involving U.S. anti-missile systems in space, *see* GRAHAM, *supra* note 32. *See also* Goedhuis, *supra* note 9; *Soviets See Shuttle as Killer Satellite*, AV. WK. AND SPACE TECH., April 17, 1978, at 17 (Soviets view space shuttle as antisatellite weapon capable of stealing or destroying satellite); *Accelerated Laser Weapons Program Urged*, AV. WK. AND SPACE TECH., August 4, 1980, at 52; Klass, *Satellite Vulnerability Fixes Emphasized*, AV. WK. AND SPACE TECH., October 24, 1977, at 58 (United States in process of "hardening" its satellites to make them less vulnerable to antisatellite weapons); A. Kantrowitz, *Propulsion to Orbit By Ground-Based Lasers*, ASTRONAUTICS AND AERONAUTICS, May, 1972, at 74; HEITCHUE, ED., SPACE SYSTEMS TECHNOLOGY (1968). For an overview of civilian activities in space, *see* D. SMITH, SPACE STATIONS: INTERNATIONAL LAW AND POLICY (1979); G. K. O'NEILL, THE HIGH FRONTIER (rev. ed. 1982). For a good discussion of commercial activities in space, see Dula, *Regulation of Private Commercial Space Activities*, 23 JURIMETRICS J. 156 (1983). For a stimulating basic treatment of the subject, *see* B. BOVA, THE HIGH ROAD (1981).

to determine the goals of the international community in outer space. Once we have identified those goals, we proceed to a discussion of specific proposals calculated to achieve them.

GOALS

The goals of the international community with regard to the exploration and exploitation of outer space are to some extent inconsistent. On the one hand, every effort has been made to ensure the equitable distribution of resources garnered from space;[34] on the other hand the creation of incentives for states and organizations to develop those resources, and hence ensure that there will be something to distribute, has received less attention.[35] By providing few incentives for commercial exploitation of outer space, these efforts have ensured that the space activities of the spacegoing nations have been primarily military in character,[36] in spite of the widely professed goal of demilitarizing space.[37] The result is that most proposals to regulate space activities place too much emphasis on restricting military operations and installations. One unfortunate by-product of such regulation may be the unwitting discouragement of productive and potentially stability-enhancing commercial space activities.[38]

One example of this approach is provided by Daniel Deudney's just-cited recent article in *Foreign Policy*. In order to reduce the likelihood of large-scale military installations in space, Deudney suggests a treaty banning the use of nuclear power plants in outer space. While this proposal is laudable insofar as it

[34]*See, e.g.*, Moon Treaty, *supra* note 28. *See also* Dula, *Free Enterprise and the Moon Treaty, supra* note 8; Dula, *Regulation of Private Commercial Space Activities, supra* note 33; Vicas, *The New International Economic Order and the Emerging Space Regime,* in Matte, *supra* note 33, at 293–307.

[35]*See, e.g.*, BOCKSTIEGEL, PRESENT AND FUTURE REGULATION OF SPACE ACTIVITIES BY PRIVATE INDUSTRY in Halket, *id.* at p.133. *But cf.* Wijkman and Wihlborg, *Global Use and Regulation of Space Activities Under the Common Heritage Principle,* in *id.* at 119–131 (contending that "minimal government regulation of space activities can achieve the standard objectives of efficiency and fairness. . . . To achieve these objectives, we propose that an International Space Condominium, in which nations would hold shares entitling them to dividends, auction user rights to space resources.") This proposal is one of the few cogent attempts to deal with the problems of access to and distribution of outer space resources; accordingly, it is dealt with at length in the next section of the text. *See also* D. Smith, *supra* note 33, at 162–63. *Compare* Dettmering, Die Rechstellung von Menschen, Stationen and Niederlassungen auf Himmelskopern (Diss., Wurzburg, 1971) (cited in BOCKSTIEGEL, *supra;* argues that commercial use of outer space would violate international law as embodied in Moon Treaty. Bockstiegel disagrees with this argument.)

[36]Deudney, *supra* note 3, at 92 (asserting that "the military today accounts for close to 75 percent of U.S. space spending. Similar budgetary priorities characterize Soviet space spending.")

[37]*See, e.g.*, E. Rostow, Testimony Before The Arms Control Subcommittee Of the Senate Foreign Relations Committee at 4–5 (September 20, 1982).

[38]*Accord,* MCDOUGAL, LASSWELL & VLASIC, *supra* note 10, at 393–401. In this connection, it is instructive to note that the Soviets view the United States Space Shuttle as an offensive weapon, while the National Aeronautics and Space Administration foresees both military and civilian uses for the Shuttle. *See Soviets See Shuttle as Killer Satellite,* AV. WK. AND SPACE TECH., April 17, 1978. *Cf.* Gorove, *The Space Shuttle: Some of Its Features and Legal Implications,* 6 ANNALS OF AIR AND SPACE L. 381 (1981).

relates to space demilitarization, it might in the long run deprive space enterprises, and the nations of the earth, of a valuable energy source.[39] And, as recent events have demonstrated, conflicts over access to scarce energy resources can be a major source of international instability.[40] While a ban on nuclear reactors in orbit might have certain short-term benefits for arms-control purposes, it could render large-scale space manufacturing projects much less attractive by depriving them of an important source of power.[41] Since nations are willing to spend seemingly endless amounts of money on military projects, while commercial enterprises must show a profit, such a ban is more likely to inhibit civilian undertakings than military ones. Once again, a proposal intended to reduce military presence in space turns out to have the effect of crowding out nonmilitary endeavors. This inconsistency between intent and result is the product of an inability to define precise policy goals coupled with a failure to examine the likely results of proposed policies beyond the short term.

Our reading of the current agreements and declarations involving activities in outer space suggests that the following two goals are generally held by the spacefaring nations and the world at large:

1. *Security; i.e.*, the prevention of armed conflict in space and the prevention of conditions in space which would encourage or exacerbate armed conflict on earth. To this end, nations have entered into a variety of

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[39]One commentator has stressed emphatically the importance of space-based power technology to the developing countries. *See* N. JASENTULIYANA, THIRD-WORLD PERSPECTIVES OF SPACE TECHNOLOGY, in Halket, *supra* note 8, at 261, 264–65 ["Although solar power satellites . . . are being planned primarily by the launching States for their own use, eventually their impact is expected to be far greater and more dramatic in the Third-World countries. For example . . . to add one solar-power satellite to the electrical system in a country such as the United States would change its capacity by two percent; to add one solar-power satellite in India would increase India's electrical capacity by forty percent. Further, as the industrialized countries use solar-power satellites, their demand for petroleum should shrink, reducing the cost of traditional energy sources required for transportation and food production in the Third World. Thus . . . it would be a serious error for the Third-World countries to dismiss space technology as irrelevant to their needs."] In light of such concerns, arms-control proposals which would restrict space development in nonmilitary arenas should be strictly scrutinized.

[40]Consider the war between Iran and Iraq, or the ongoing disputes over continental shelf resources in a variety of locations around the world. *Cf.* the *North Sea Continental Shelf Case*, 1969 I.C.J. 12.

[41]Admittedly, a variety of other sources of power may be available. At this early date, however, it is impossible to say what power sources will be crucial to space development. Thus, any efforts to ban particular technologies may inhibit the development of important sources of global wealth in the future, and do so in near ignorance. *See* Wijkman and Wihlborg, *supra* note 35, at 127–128. One commentator has discussed at length the implications for international law of nuclear power sources in space. REIJNEN, UTILIZATION OF OUTER SPACE AND INTERNATIONAL LAW 41–58 (1981). *See also* Reiskind, *Toward a Responsible Use of Nuclear Power in Outer Space—The Canadian Initiative in the United Nations*, 6 ANNALS OF AIR AND SPACE L. 461 (1981) [discusses Canadian response to crash of Soviet satellite Cosmos 954; includes comment by Maxwell Cohen]. For general discussions of space energy development plans, see R. HEITCHUE, ED., SPACE SYSTEMS TECHNOLOGY (1968), and HAVILAND AND HOUSE, HANDBOOK OF SPACE VEHICLES (1965).

agreements, such as the Outer Space Treaty, designed to limit the usefulness of outer space as a base for aggressive military activities.[42]

2. *Prosperity.* Nations which possess or expect to develop significant space capabilities wish to have as much freedom as possible to develop space resources. Those nations which lack space capabilities wish to share in the benefits of space resources. While these desires conflict to some degree, they also coincide significantly. There are, after all, no benefits for anyone if no nation or organization has any incentive to develop space at all. Thus, it seems reasonable to say that while disagreements may exist regarding the appropriate distribution of wealth, the development of space is a goal shared by all nations.[43]

Having arrived at this statement of goals, it seems fair to say that any international regime for the ordering of outer space activity should be judged on whether it is likely to foster commercial development and international stability over the long term. There is no reason why these two goals should be seen as inherently inconsistent. It appears, in fact, that a regime which fosters orderly commercial development[44] is most likely to lead to military stability.

Achieving Goals: Analogies and Analysis

There are, after all, other areas in which nations are able to utilize common resources with a minimum of conflict. Perhaps the oldest and most familiar of these is the international use of oceans for navigation and fishing.[45] Unlike some commentators, we believe that space resources more closely resemble these non-exhaustible resources than the kinds of resources dealt with, for example, in the United Nations Convention on the Law of the Sea (UNCLOS).[46] It

[42]*See* E. Rostow, *The Task Ahead, supra* note 10, at 1 (stating that "our goal should be to make certain that man's great adventure in outer space be conducted in peace, and that it reinforce the effort to achieve peace on earth . . .).

[43]*See* JASENTULIYANA, *supra* note 39. *See also* MCDOUGAL, LASSWELL & VLASIC, *supra* note 10, at 141–151.

[44]As used here, commercial development is also thought to embrace government-sponsored resource development activities, and not simply private for-profit endeavors. *See* Alfred Dunhill of London, Inc. v. Republic of Cuba, 425 U.S. 682 (1976) [Cuban government, acting in role of commercial entity, treated as such]. Of course, non-commercial activities such as scientific research may also contribute to international stability. A good example is the International Geophysical Year. *See* MCDOUGALL, LASSWELL & VLASIC, *supra* note 10, at 202–206 (one important effect of the IGY "consists in its having secured the tacit acceptance of the governments of so many states of the principle that orbiting satellites, as well as other uses of space for non-harmful purposes, represents a lawful activity that does not infringe upon any protected interest of states or others.")

[45]*See, e.g.*, Michell, *The European Fisheries in European History,* in 5 CAMBRIDGE ECONOMIC HISTORY OF EUROPE 133–184 (Rich and Wilson eds. 1977), and McDowell, *International Conventions and Treaties,* in OCEAN TRANSPORTATION 430–443 (McDowell and Gibbs eds. 1954). *Cf.* G. GAL, SPACE LAW 117–129 (1969) (discussing analogy between space and sea, and character of outer space as *res communis omnium*).

[46]Third United Nations Conference on the Law of the Sea, A/Conf.62/W.P.10/Res. 3, August 27, 1980. *Compare* Declaration of Principles Governing the Seabed and the Ocean Floor, and Sub-

should be noted in this connection that, consonant with the view of a number of influential scholars, commercial and other nonmilitary uses of the sea have long provided strong incentives for nations to avoid conflict that might imperil those uses.[47] Military goals, as a result, are often subordinated to commercial interests.[48] This subordination occurs notwithstanding the fact that, like space, the sea is of critical importance to the military operations of a powerful nation.[49]

One question that must be addressed at this point in the analysis is whether it is possible to structure *a priori* an international system capable of fostering the dual goals identified above. The problem extends beyond structuring the proper incentives and penalties; it encompasses a conscious attempt to recreate the evolution of the complex of relationships and understandings governing (for example) maritime affairs. The problem is formidable, since those relationships and understandings evolved unconsciously and are both explicitly stated and implicitly recognized by seafaring nations.[50]

In contrast to the long-established order of ocean navigation and fishing, the recent efforts to structure an international regime in the area of deep seabed mining in international waters provide an excellent example of the dangers inherent in attempts to create an international order from the ground up. As some commentators have observed, the UNCLOS proposals could have the effect of presenting an overwhelming set of perverse incentives to potential mining en-

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soil Thereof, Beyond the Limits of National Jurisdiction, G.A. Res. 2749, 25 G.A.O.R. Supp. 28 A/8028 24, December 17, 1970. For a thorough and lucid analysis of United States policy concerning the above, *see* Hufford, *Ideological Rigidity v. Political Reality: A Critique of President Reagan's Policy on the Law of the Sea*, 2 YALE L. & POL'Y REV. 127 (1983). Hufford argues that a stable and internationally-recognized regime is necessary for the effective exploitation of undersea resources. *Compare* Charney, *The International Regime for the Deep Seabed: Past Conflicts and Proposals for Progress*, 17 HARV. INT'L L.J. 1 (1976). In this connection, it is worth noting that at least one space resource may arguably be considered exhaustible: geosynchronous earth orbits. Currently, the need to avoid interference requires that communications satellites in geosynchronous orbit be spaced at least four degrees of arc from one another, thus limiting the number of "slots" for such satellites to ninety. However, improvements in transmitting and receiving equipment, coupled with the use of techniques of signal encoding and processing such as orthogonal polarization and time-division multiple access (generally abbreviated as TDMA), should overcome current interference problems and allow far greater numbers of satellites to be placed in geosynchronous orbit. *See* Science And Technology Brief, *Space-age Communications*, THE ECONOMIST, August 13, 1983, at, 70–71. For an excellent discussion of the technologies relating to orbital "slots" and their international legal implications *see* Hood, *et al.*, *A Global Satellite Observation System for Earth Resources: Problems and Prospects*, AMERICAN SOCIETY OF INTERNATIONAL LAW STUDIES IN TRANSNATIONAL LEGAL POLICY NO. 15 (1977). For an in-depth discussion of satellite orbital mechanics and related matters *see* STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE, *supra* note 27, at 98–130.

[47]*See* GILMORE AND BLACK, THE LAW OF ADMIRALTY 959 *et seq.* (2d ed. 1975). *Cf.* MCDOUGALL, LASSWELL & VLASIC, *supra* note 10, at 167–189 ("It is clear that some business elements expect to guide and benefit from the use of outer space . . . interdependence will almost certainly increase throughout the entire world community, and . . . this implacably carries with it the growth of inclusive interests relative to exclusive or special interests.")

[48]GILMORE AND BLACK, *id.*, at 959–60.

[49]*See, e.g.*, MAHAN, THE INFLUENCE OF SEA POWER ON HISTORY, 1680–1783 (1890).

[50]*See, e.g.*, K. Glammann, *The Changing Patterns of Trade*, in Rich and Wilson, *supra* note 45 at 185–289. *See generally* CLOUGH & COLE, ECONOMIC HISTORY OF EUROPE (3d ed. 1952).

trepreneurs.[51] Consequently, the proposals may serve only to guarantee that the resources locked beneath the sea are never introduced into the economies of the world. An intelligent order in outer space would prevent such a situation.

Thus, there are compelling reasons to view with suspicion attempts to construct an *a priori* system in outer space. Rather, concern should be focused on the creation of incentives that will result in the evolution of a stable and equitable order for activities in space. An evolutionary process would have two advantages: first, relative immunity to the often-paralyzing effects of international politics and second, flexibility in its response to changing technologies and global concerns. An essential part of such a process, we believe, is the development of extensive commercial activity by states and other organizations. Such activity is likely to promote the interdependence which has led to stability in other areas of international relations, as well as the development of resources desired by all nations.[52]

In attempting to determine ways of setting up an evolutionary process[53] that will evolve in directions which are generally considered desirable, it may be helpful to examine analogous international systems in an attempt to determine what factors are responsible for their developing as they did. Once again, the system of international navigation and fishing provides a helpful model.

The current system of international norms involving use of the oceans grew out of the following factors: first, the use of the oceans for navigation and fishing is a "positive-sum game," in which all participants benefit from gener-

[51] *See, e.g.*, Statement of Mr. Ratiner of the United States, Provisional Summary Record of the 14th Meeting of Committee I, U.N. Doc. A/Conf. 62/C.1/SR.14, at 17 (1974); statement of Mr. Knoke of the Federal Republic of Germany, *id.*

[52] It is likely that the criticisms leveled against putatively pro-market proposals in the deep seabed mining literature will be echoed in the space arena. Largely as a preemptive measure, we feel it is important to discuss such criticism here. Scholars of all political stripes must grasp an essential truth: markets are mechanisms, not simply surrogates for the implementation of "conservative" policies. Markets can be used to enforce a wide range of policy goals, regardless of the ideological character of those goals. Creative use of boundary conditions and incentives in conjunction with market mechanisms can significantly reduce the cost of administering a given policy. Thus, it is our contention that markets can play a vital role in implementing—as opposed to defining—the goals we see as important in outer space (*i.e.*, stability and equitable distribution of resources). The increasing degree to which governments of all stripes, and particularly Marxist governments, are beginning to rely on market incentives bears out this observation. For an example of a proposal involving use of market mechanisms to allocate space resources, see Vicas, *Efficiency, Equity and the Optimum Utilization of Outer Space as a Common Resource*, 5 ANNALS OF AIR AND SPACE L. 589 (1980).

[53] Professor Clark of Harvard recently outlined a provocative field of legal inquiry that seeks to explain, in a Darwinian fashion, why some rules and doctrines survive the test of time and why others fade away. Clark, *The Interdisciplinary Study of Legal Evolution*, 90 YALE L.J. 1238 (1980). Professor Clark is concerned primarily with survival as a function of efficiency in commercial law, an idea of relevance to this analysis. For example, consider the following passage written by Joseph Story:

> Let it not . . . be imagined that the maritime law, as acknowledged and practiced upon by the most enlightened nations of the present day, was produced *per saltum*, by the sudden start of a single mind or nation, generalizing or analyzing the principles at a single effort. Far different is the case. It arrived at its present comparative perfection by slow and cautious steps; by the gradual accumulations of distant times, and the contributions of various nations. Industry and

ally open access; second, generally open access is furthered by a loose, but more-or-less uniform system of regulation; third, significant incentives exist for individuals, states, and organizations to devote capital to participation which, as discussed, benefits everyone.[54] Of course, disputes over sea-based resources have not been uncommon in maritime history. However, rarely have these disputes been of such a magnitude that they threatened the integrity of the maritime system.[55]

The problem, then, is to apply the lessons learned in the development of the maritime system to the design of a space system—*before* disputes arise. It seems evident that each major class of maritime dispute gave rise to a norm whose effect was to prevent similar disputes in the future.[56] Accordingly, adoption of a system that encourages analogous norms to develop rapidly should serve to prevent a significant number of conflicts involving space.[57]

GENERAL GUIDELINES

To encourage the exploration and utilization of space while avoiding cataclysmic confrontations—these are the goals that must be accommodated. In ac-

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patience first collected the scattered rays, emitting from a thousand points through the dim vista of past ages; and philosophy reflected them back with tenfold brilliancy and symmetry. If, indeed, a professional mind might indulge in a momentary enthusiasm, it would perceive, that in this process had been realized the enchantment and wonders of the Kaleidoscope, where broken and disjointed materials, however rude, are shaped into inexhaustible varieties of figures, all perfect in their order and harmonies, by the adjustment of reflected light under the guidance of philosophy.

J. STORY, MISCELLANEOUS WRITINGS (1835), *reprinted in* J. LUCAS, CASES AND MATERIALS ON ADMIRALTY 354 (2d ed. 1978).

[54]Increased participation, of course, encourages competition and hence prevents excessively high rates while tending to result in more routes and customers being served. *See, e.g.*, A. H. Vanags, *Flag Discrimination: An Economic Analysis*, in ADVANCES IN MARITIME ECONOMICS (R. Goss ed. 1977) 37 *et seq.* For a discussion of how economic interdependence and peaceful relations go together in the shipping world, *see* O. KNUDSEN, THE POLITICS OF INTERNATIONAL SHIPPING (1973) 20–23, 160–61. With regard to the system of regulation in international maritime law see STORY, *supra* note 53, and United States v. Webb, Inc. 397 U.S. 179, 191 (1969) ("Maritime law, the common law of seafaring men, provides an established network of rules and decisions suited to the necessities of the sea.") This passage is quoted in GILMORE AND BLACK, *supra* note 46, at 45 n.150. For a lucid and thoroughly authoritative discussion of the nature and sources of the maritime law, *see id.* at 1–52.

[55]*See, e.g.*, KIRKALDY AND EVANS, THE HISTORY AND ECONOMICS OF TRANSPORT 289–374, at 340 (1931). ("Even the blockading of a single coast . . . has been found to entail very great, if not insuperable, difficulties, whilst the stoppage of world trade on a large scale is well-nigh unthinkable.")

[56]*Id. See also* KNUDSEN, *supra* note 54. *Cf.* Clark, *supra* note 53.

[57]This notion finds support in Dula, *Free Enterprise and the Proposed Moon Treaty*, *supra* note 8, at 23–24. Dula argues that "Space industrialization requires the establishment of realistic laws. . . . Present space law, including the Moon Treaty, has been forged almost entirely out of high academic ideals in advance of any practical commercial reality. True space law, if it allows free enterprise to operate at all, will evolve to meet the needs of practical commercial ventures. In this author's opinion, practical business space law would, if not preempted, evolve shortly after space-based exploitation of basic resources and energy begins to yield substantial profits. History teaches that the transition between academic and practical legal regimes can be gradual or traumatic, but that such transitions inevitably occur."

cordance with these goals, the following general guidelines appear to us to be useful starting places for a system of international relations in space: (1) incentives to explore and develop space resources; (2) secure claims to the right to exploit any resource that one discovers and invests in developing; (3) mandatory contribution to an international body whose mission is to arbitrate claim disputes in outer space; (4) encouragement of joint enterprises in space, to foster the formation of consortia among less developed countries (LDCs); and (5) the adoption of measures designed to prevent or minimize military action in space and to ensure that such actions are recognized as such should they occur. These proposals are dealt with individually in the sections that follow.

Incentives

It is not necessary to grant sovereign or quasi-sovereign status to space venturers, as was done in the great era of earth exploration.[58] Potential space investors are, however, likely to require some assurance that they will be permitted to keep most of their gains.[59] Risk, especially for the first wave of space investors, is likely to be much greater than for comparable ventures on earth. As a result, investors will expect a rate of return commensurate with those risks.[60] Fear of confiscatory international regimes, when combined with the amount of natural skepticism always present in the face of untried ventures, can otherwise be expected to deter many beneficial projects. Imagine the effect such regimes might have had on the explorers of an earlier era—would they have set out at all in the face of a massive tax on the proceeds of their endeavors? It is a truism that when an activity is taxed, society gets less of it. This fact is, however, seldom kept in mind during discussions of the distribution of wealth from space activities.

Security of Claims

An obvious corollary to the above discussion of incentives is the necessity that enterprises have some assurance that their efforts to make use of space resources will not be subject to interference by other enterprises or by the military branches of states.[61] Such assurance does not constitute a right to exclusive use of a resource, except in the narrowest sense (i.e., in the same sense that an

[58] *See, e.g.*, KIRKALDY & EVANS, *supra* note 55, 296 *et seq.* and CLOUGH AND COLE, *supra* note 50, 175–177. *See* also BOWDEN, ET AL., AN ECONOMIC HISTORY OF EUROPE SINCE 1750 at 417 (1937). (Sovereign status of British East India Company extended to governance of British India until 1853.)

[59] *See* Hoover, *Law and Security In Outer Space from the Viewpoint of Private Industry*, 11 J. SPACE L. 115, 123 (1983). *Cf., contra*, NOZARI, THE LAW OF OUTER SPACE, 233 *et seq.* (1973).

[60] Hoover, *id.*, at 124. *See* Dula, *Regulation of Private Commerical Space Activities, supra* note 33, at 156,186–89 and Vicas, *supra* note 52, at 589–609, 594 (1980) [regardless of whether it applies to government or private space initiatives, "[t]he rate of return must be at least equal to the normal rate, adjusted for the degree of risk."]. *See also* BREALEY AND MYERS, PRINCIPLES OF CORPORATE FINANCE 141–150 (1981) (on relationship between risk and return).

[61] Hoover, *id.* 116 *et seq.*

oceangoing vessel's passage requires the exclusive use of the small patch of ocean which it occupies). Rather, it embodies the very basic right to be left alone. To some extent, of course, that right will be protected by whatever military forces the enterprise can claim protection from (its own, if the enterprise is a governmental one, or its government's, if the enterprise is a private one). Such protection may be enough—it is, after all, about all that is available to enforce the maritime order.[62] Ideally, however, some source of protection should be developed which is less dependent upon the use or threat of force.

International Arbitration

One means of reducing the danger of violent efforts to resolve disputes would be the establishment of an internationally composed arbitration panel to resolve conflicts among space enterprises, whether private or governmental. The relatively minuscule costs of such a panel could be financed by contributions from space enterprises. Such panels are well-known and frequently used in the international arena already, so that the extention of their use to space issues is quite natural.[63]

All participants in space ventures would be required to submit disputes to the arbitration panel. The panel members would be selected by the particular disputants according to the now-familiar formula of one each, with the two chosen then choosing a third. Other formulations are of course acceptable; what is important is that all parties agree to the arrangement beforehand. This will provide an orderly and widely accepted process for the resolution of disputes.

Encouragement of LDC Participation

The resources of outer space should be available to all, and substantial measures should be taken to avoid the division of the world's nations into space haves and have-nots. Such measures should be designed to increase overall participation rather than to tax initial participants. One important way to ensure this is to provide special incentives for less-developed countries to form space development consortia. It seems likely that the major space powers would have an interest in encouraging LDCs to form consortia, if for no other reason than to contribute to political stability.[64] For the same reason, the developed nations

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[62]For a discussion of this topic see Reisman, *Sanctions and Enforcement*, in INTERNATIONAL LAW ESSAYS 381 (McDougal and Reisman eds. 1981). Note also that imposition of responsibility on the flag state for actions of persons or enterprises under its jurisdiction is a generally accepted principle of space law. *See, e.g.*, GAL, *supra* note 45 at 207–215. *See also* Reijnen, *supra* note 41 at 111–121 (1981) (Outer Space Treaty of 1967 provides that "states bear international responsibility for national activities in outer space").

[63]The effectiveness of arbitration in international matters has been impressive. *See, e.g.*, GILMORE AND BLACK, *supra* note 46, 582–83.

[64]*See* N. MATTE, SPACE POLICY AND PROGRAMMES TODAY AND TOMORROW: THE VANISHING DUOPOLE 87 *et seq.* (1980).

would also have an interest in extending the reach of organizations such as the World Bank to include the financing of space projects.

Such a scheme could contribute to space development as a whole in a number of ways. First, it would lower the barrier of capital formation which, in the pioneering period, will surely be formidable. Second, it would give LDCs a stake in the space policies of the international community, thus enhancing the legitimacy of the international space regime. And third, it would very likely lead to substantial increases in the material wealth of LDCs, conceivably contributing to their political stability. These nations could also participate in ways which would not require the acquisition of spacegoing capabilities. Some space technologies (e.g., antennas for receiving beamed power from solar power satellites) are relatively inexpensive but could be especially valuable to less-developed countries.[65]

Preventing Damage from Military Action

Legitimate protection of space resources from piracy, sabotage, or outright seizure may make some military presence in space necessary. However, this presence must not be allowed to discourage investment. Some sort of accountability for damage of commercial operations in space due to military action thus seems necessary. Two questions immediately present themselves: first, how would such liability be determined (i.e., how could it be ascertained that damage was the result of military action and not, for example, collision with space debris);[66] and, second, how would such liability be enforced?

The first question is easy enough to answer: the rapidly evolving technology of space surveillance is approaching such capabilities now.[67] By the time extensive commercial presences in space exist, such a task is certain to pose no great challenge. The prospect of commercial presences, furthermore, provides additional incentive for nations (and, conceivably, private organizations such as insurance companies) to develop such a capability.

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[65]JASENTULIYANA, *supra* note 41, and passage reproduced at that note.

[66]Space vehicles are susceptible of damage from several sources: military attack, as discussed; micrometeoroids and meteor showers; destruction upon reentry due to orbital decay; and long-term damage from solar radiation. Several commentators have registered concern over the possibility that an accidental nuclear confrontation on earth might result from damage to an important reconnaissance or early-warning satellite in space. *See* Deudney, *supra* note 3, at 101 ("The Archduke Francis Ferdinand of World War III may well be a critical U.S. or Soviet reconnaissance satellite hit by a piece of space junk during a crisis."). *See also* Menter, *supra* note 11 at 595 and sources cited therein, and HACKETT, *supra* note 20. On micrometeoroids, see HAVILAND AND HOUSE, *supra* note 41, at 185, 269. On long-term decay due to space "sandblasting" effect, see *id.* at 269; *see also* Winkler, *Improved Model for the Performance of Spacecraft Materials*, in SELECTED PAPERS FROM THE 27TH ANNUAL INTERNATIONAL AERONAUTICAL CONGRESS, ANAHEIM, CALIFORNIA, OCTOBER 10-16, 1976 (Napolitano ed. 1976). On damage due to reentry upon orbital decay, *cf.* Reiskind, *supra* note 41. On solar radiation effects, *see* Winkler, *id.*, at 709.

[67]*See* RITCHIE, *supra* note 22 at 76-96, 95. (Current surveillance systems "are reportedly capable of seeing something the size of a watermelon in geosynchronous orbit 32,000 kilometers high." These systems, developed in 1955, are currently being replaced with more capable equipment.)

The second question is less easy to answer. The enforcement of international norms, given the relative inefficacy of international organizations, has been left largely to individual nations.[68] There is every reason to expect that such will be the case in outer space as well, barring some unexpected revolution in the way nations conduct their affairs. The relative vulnerability of space installations to attack, however, should militate against too-ready resort to hostilities. Any nation with the space capabilities required to undertake hostile action, it seems, would be likely to possess extensive space facilities of its own. The vulnerability of these facilities to retaliation should provide a strong disincentive to military action in space. Once again, the maritime analogy comes to mind.

CONCLUSION

We have argued here that the best way to keep space from becoming a barren battlefield is to promote its commercial development. However, this is not to say that arms control agreements have no place in a legal regime governing outer space activities. Indeed, incentives for commercial development should be seen as an adjunct to, rather than a substitute for, such agreements. However, if treaties restricting military activities in outer space are not to have the effect of excluding most nonmilitary activity as well, they should be limited in two important ways. First, they should be drawn so as to inhibit commercial and scientific activity as little as possible. And second, they should be limited in duration, so as to enable the international community to adapt to changing technology while ensuring that important commercial activities are not frustrated by outdated rules.

Appropriate uses of outer space may include a wide variety of specific activities. What is important is that those uses contribute to the overriding goals of stability and prosperity. Too many current proposals for the ordering of activity in outer space lose sight of these goals in a thicket of overly specific rules and regulations. The trick is to set things up at the beginning so as to encourage the development of productive uses. We believe that the establishment of conditions which provide incentives for nations and enterprises to exploit the resources of outer space is an effective way of diverting emphasis from the militarization of outer space. While some military presence in outer space probably is inevitable, we hope for a regime that will render that presence largely irrelevant.

[68] *Cf.* Reisman, *supra* note 62.