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ARTICLE: SYMPOSIUM: ISSUES IN **SPACE LAW**: Bringing **Space Law** into the Commercial World:
Property Rights without Sovereignty

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SUMMARY:

... Private firms seeking to invest in potential space enterprises frequently point to these provisions as a major barrier to the future commercial development of space. ... Similarly, ownership of permanent structures that might be constructed on celestial bodies, including the moon, will vest in the company or state building the structure, at least to the extent it is placed "on a celestial body." ... Although this right to use the spectrum is not exactly a traditional property right, it does grant use of a limited resource in space for business purposes for the lifetime of the particular satellite proposed to be used. ... But in the reasonably near future, no company operating in space will likely need outright ownership of space territory, including land on the moon. ... These ventures did not involve territorial rights in space as would a venture to perform mining operations on the moon, but they did involve very risky, high up-front capital funds and a long-term commitment to space satellites. ... In other words, national law, and any claim based upon registration under it, is irrelevant with respect to determining possible private ownership of "real estate" on the moon. ... There is no particular commercial problem currently or in the foreseeable future where the lack of sovereignty plays a significant role. ...

TEXT:

[*81] I. INTRODUCTION

International agreements declare that no government can claim outer space or celestial bodies in outer space as its own. n1 Private firms seeking to invest in potential space enterprises frequently point to these provisions as a major barrier to the future commercial development of space. Such businesses contend that the absence of property rights prevent them from obtaining external financing, hinder the protection of their investments in space, and deprive them of the assurance that they can appropriate income from their investment. In short, the lack of sovereignty in space jeopardizes the ability to make profits from private

investment.

[*82] This article will critique those claims, arguing that most property rights exist in space and that the lack of sovereignty does not pose current or nearterm problems for the types of business ventures likely to be developed in space. Furthermore, even in the case of future ventures, solutions based on terrestrial models would permit private companies to operate in space with reasonable reliance of the right to appropriate income from their investments.

The most threatening current problem surrounding the issue of real property rights in space is in actuality not related to space entrepreneurship. It instead arises from shortsighted greed premised on misinterpretations of treaties and other applicable laws. For example, several companies have been selling land on the moon and issuing "deeds" to that land, behavior which unequivocally violates **space law** treaties. If the public perceives that this action is legal, as evidenced by a lack of government willingness in putting a halt to these activities, serious harm could result in the future.

Regardless of this near-term problem, it is important to evaluate the true meaning of the lack of sovereignty in space in a commercial context. Following such analysis, this Article concludes that the lack of sovereignty will not deter future private space ventures to the extent commonly believed. Ownership problems raised by international agreements have solutions not requiring a major change in existing **space law**, but rather carefully drafted additions and amendments to the current legal regime.

II. PROPERTY RIGHTS THAT EXIST IN SPACE

There are actually a wide variety of space activities involving clearly delineated ownership recognized by national legal bodies throughout the world. First, anything that is launched into space is deemed to be owned by the launching party or state, including the launch vehicle, all of its associated stages and parts, and the payload that is placed into space. n2 Not only do property rights attach to these objects, but the owner(s) can be held singularly and jointly liable for damage caused by these objects -- if the owner is either itself the government of a launching state, or held to reimburse any international claims to be paid by such a government. n3 Thus, sovereignty in some form exists for satellites and aboard space stations.

[*83] Similarly, ownership of permanent structures that might be constructed on celestial bodies, including the moon, will vest in the company or state building the structure, at least to the extent it is placed "on a celestial body." n4 With regard to any structure essentially made from locally available resources, there are no clear rules, and it may be valuable to establish clarity on this subject.

Commercial space today is dominated by communications satellites owned by private companies or national governments. These national governments and the International Telecommunications Union ("ITU") allocate the right to use spectrum to these communications satellites. n5 Although this right to use the spectrum is not exactly a traditional property right, it does grant use of a limited resource in space for business purposes for the lifetime of the particular satellite proposed to be used.

Anything taken from space and returned to the earth becomes the property of the person, company, or government that performs the action, given the absence of United Nations treaty provisions prohibiting such ownership. Added legal certainty may eventually become necessary to prevent the undue stifling of relevant private interests, especially with regard to minerals and other potentially valuable resources that could be mined from celestial bodies. But as nations become increasingly aware of the possibility of inflicting environmental damage on celestial bodies, most will likely limit any government or private activity that might endanger lunar or other celestial environments. n6

The United Nations Treaties on Outer Space contain no explicit provisions about intellectual property rights for things made or invented in space. However, [*84] the Inter-Governmental Agreement on the Space Station n7 and the NASA Directive on Space Station Intellectual Property n8 provide some guidance. This issue is discussed in more detail below.

III. THE UNITED NATIONS CONVENTIONS AND THE LACK OF SOVEREIGNTY IN SPACE

A number of United Nations Treaty provisions can have an impact on property rights in space. n9 Most notably, the Outer Space Treaty prohibits governments from claiming sovereignty over space or for any celestial body. n10 Therefore, no nation can give its citizens or any other nation exclusive use of any territory. But in practice, few nations actually possess capability to access celestial bodies, such as the moon or asteroids, which could contain valuable resources or function as strategic research locations. Furthermore, because equipment launched into space or created in space by a nation (or its citizens) is owned by that nation (or citizen) and controlled by that nation's laws, there would be an associated right to protect that equipment. The lack of ownership of territory in space does not preclude private sector for-profit use of the territory nor subject investments in space equipment to the whims of other nations.

Governments may also be held absolutely liable for the actions of their citizens in space, n11 although only for terrestrial damage and damage to airplanes [*85] in flight. However, since transporting equipment or payloads into space requires a launch and since virtually any space activity could have an effect on the Earth, this ostensibly limited liability has prompted government regulation of safety and financial responsibility for private activities in space. Because potential liability will rise as more private actors enter space, many nations without such licensing requirements are currently writing new legislation. n12 The principle of space as the province of all mankind and using space only for the benefits for mankind is a central theme of the international agreements. n13 However, legal scholars continue to debate about the precise legal consequences which should be drawn from the equation that space, as province of all mankind, should be regarded as *terra communis* as opposed to *terra nullius* , n14 a conception under which a nation may eventually claim sovereignty. However, the Outer Space Treaties prohibit nations from recognizing sovereignty claims over celestial bodies.

The Moon Agreement, the last Outer Space Treaty to be adopted, goes further by declaring the moon to be the common heritage of mankind. n15 This terminology suggests that an even higher principle of equity would be applied to the moon's surface -- if one nation or its citizens were to exploit lunar resources, the technology employed to do so and a portion of the proceeds thus garnered would have to be shared with all nations. By essentially precluding proprietary rights and profits, this scenario would greatly diminish the impetus for commercial development. Thus, even with the Moon Agreement's entry into force, only eleven states have ratified it, and an additional five states have signed it. None of the sixteen States are major space-faring nations, except for France and India, which have signed but not ratified the Treaty. Future enforcement of [*86] the Moon Agreement's common heritage provisions obviously remains questionable.

Property rights exist in space, even without ownership or territorial rights to celestial bodies, although their applicability to resource extraction remains a contentious issue. Exactly what those rights are and how far they may apply to the extraction of resources is still under debate, creating uncertainty for a company looking to invest in such ventures. However, given the limitations of modern technology and the cost of reaching such remote regions, extracting resources from space is a formidable problem. Companies seeking to profit from such enterprises must obtain a major subsidy from a governmental entity, and only one nation, the United States, has the economic and technological capability, although others could achieve it within a decade. At that future time, it may become necessary to devise a method of allocating territory in space. Negotiations could result in the selection of an international organization empowered to oversee such activity and to act as an intermediary between national governments and private firms. But while it remains prudent to consider such options today, it is premature to implement any solution.

IV. UNDEFINED, RESTRICTED, OR AMBIGUOUS PROPERTY RIGHTS IN SPACE

This section details some problems arising from the imprecise definition of property rights in space, particularly with regard to ownership and liability for spacecraft, satellites, and other space facilities. These dynamics complicate commercial transactions in space as compared to those involving similar terrestrial equipment.

An international system (the ITU regime) presently coordinates the use of frequencies. It ensures, in principle and with the stipulation that the parties abide by the agreement, avoidance of interference, without actually providing for "ownership" of the relevant frequencies. n16

But since the ITU's formal agreement only confers upon it the authority to coordinate frequencies, this system poses other problems. For satellite communications, the use of frequencies is inseparable from the orbital slot, orbits or orbital planes where the satellite intending to use those frequencies will be located. n17 If the satellite concerned is destined for one orbital slot, intended [*87] usage of a particular frequency may cause unacceptable interference with other satellite communication activities while usage of the same frequency in a different orbital slot may be totally harmless from that perspective.

Since frequencies cannot be owned at the international level, any orbital slot or orbit accompanying these frequencies also cannot be owned, and the question that naturally arises is to what extent this absence of the possibility of (international legal) ownership of orbital slots or orbits may require solutions for reasons not discussed above vis-a-vis frequencies. In other words, do the legitimate interests of communication (or other) satellite owners in interference-free operation of their satellite necessitate more than protection of their use of frequencies, which, as indicated, will almost automatically also address the element of use of a particular orbital slot or orbit?

A. INTELLECTUAL PROPERTY RIGHTS: WHEN DIFFERENCES IN NATIONAL LAWS MAY EXIST

"Property rights" includes intellectual property rights ("IPR"), both the complex amalgam of industrial property rights like patents, and the *stricto sensu* right like copyrights, trademarks and database-ownership. In all these cases, property ultimately concerns something intangible -- the creativity or inventiveness entitling the person exercising it to continue to exert a considerable measure of control over the "products" of such creativity or inventiveness long after those attributes have ceased to be exercised. Intellectual property rights are inherently more complicated than property rights in tangible goods. Property rights in movables are characterized by a simple structure, meaning that minimal problems arise when movables cross frontiers and become subject to different jurisdictions and national laws. Property rights in immovables by definition remain within one particular jurisdiction, unless the territory concerned is transferred to another state. Like their traditional counterparts, intellectual property rights are, in the first instance, defined by national laws, stipulating the specific conditions entitling one to legal protection and the extent and terms of such protection.

In response to this piecemeal approach, major international efforts early on strove to harmonize national laws, or allow for and even stimulate mutual recognition of existing IPR awarded on a national basis. n18 Currently, the World [*88] Intellectual Property Organization ("WIPO") is seeking to further such developments. n19

Patent protection, which is grounded upon territoriality, presents special problems in the space context. The possibility of registering for protection of an invention depends upon the territory where the invention achieved fruition and the possibility of enforcing such protection require ascertaining where the infringement transpired. Infringement in space largely remains an academic matter, while the issue of inventions in outer space poses more difficulties, which a number of legal mechanisms endeavor to alleviate.

In general, under Article VIII of the Outer Space Treaty, states are entitled to exercise national jurisdiction on board spacecraft registered with and by them. Thus, states launching spacecraft with manned capability, and hence confronting the possibility of an individual developing a new invention while in outer space may apply their relevant national laws to such spacecraft. Through the Patents in Outer Space Act, the United States has accordingly extended the scope of its patent legislation to inventions made onboard United States-registered spacecraft. n20

The International Space Station ("ISS") currently being assembled in space appeared to merit a more sophisticated approach, in view of its international character and the envisaged constant movement of astronauts from different Partner States across the various, nationally registered elements of the station. But participating nations adhered to the typical approach: under Article 21 of the IGA, n21 for the purposes of applying national IPR legislation, each element of the space station registered by a Partner State qualified

as "quasi-territory." The European module was registered not by individual European countries but by the European Space Agency ("ESA") on their behalf, and was accorded similar treatment: Each ESA member state involved under the IGA was entitled to view the ESA module as its "quasi-territory" for the present purpose. n22

[*89] The only ripe issue in this area thus concerns inventions made in outer space but *not* onboard a spacecraft -- in other words, on the surface of the moon or another celestial body. The lingering question here is whether inventions created on board a lunar facility are covered by the laws of the nation owning the facility or if a future agreement concerning the territory upon which the facility rests will determine ownership rights. Since **space law** presently proscribes territorial sovereignty or even quasi-territorial appropriation, n23 solutions specific to this area will need to be devised, preferably before there is a return to the moon or before manned missions start landing on other celestial bodies.

B. COMMERCIAL TRANSACTIONS INVOLVING SPACE EQUIPMENT

The issue of sales, leases, and other transfers of ownership of space hardware, presumably while in outer space, is orthogonal to the other issues, with the overriding concern being the extent to which legal rules applicable to space hardware take the aforementioned transfer possibilities into consideration; in other words, a change of ownership causes problems beyond those present regardless of who owns the space hardware.

At the international level, liability for damage resulting from space operations is limited to damage caused by "space object[s]," which generally means damage caused by physical contact of such an object n24 and is allocated to the "launching State(s)" of that object. Notably, the definition of "launching State" n25 considers ownership (whether private or public) irrelevant. Moreover, defining a liable entity based on the launch results in the consequence of "once a liable state, always a liable state."

This results because even after space hardware changes hands in outer space, the originally liable state(s) will, under the Liability Convention, remain so until the space object under consideration ceases to exist, even if the space hardware concerns a complete satellite (space object), which, after its sale-in-orbit, no longer remains under any control of the original launching State(s). Liability can then be avoided by incorporating derogation clauses into the contract of sale, but such constructions might be cumbersome and ultimately [*90] detrimental to the commercial utilization of space. Obviously, when a comprehensive change of ownership fails to impinge upon the determination of the liable entity or entities, partial ownership transfers also do not result in any pertinent change.

Mutatis mutandis, private ownership as such is, at the first international level, not relevant at all, given that liability rests with the launching State(s). Such state or states must thereby ensure that any private party involved in satellite communications could be obligated, ordinarily under a license, to reimburse the government(s) for international claims under the Liability Convention, if the damage at issue can be attributed to that private party's involvement. Since a change in private ownership does not alone result in any change in this respect, the interested governments must make sure that any new owner would be subject to the same rules.

This situation naturally leads one to consider whether commercial space activities would ultimately benefit if a coherent international liability regime attributed liability to the entity (whether public or private) actually in charge and in control at the moment when the activity causing damage at issue occurred, as contrasted to the current system which designates a launching State(s) or authority liable. Or should the freedom to arrange for such cases on an *ad hoc* basis principally remain, only to be circumscribed by those governments that may ultimately have to bear the international consequences in terms of liability?

The efforts currently undertaken in the context of UNIDROIT n26 to arrive at a protocol on securities for spacecraft figure prominently for the future of commercial space, but since the protocol will merely activate the underlying Convention for the area of space activities, it will not alter property rights themselves. The protocol first endeavors to provide for an international register of interests in highly mobile, highly valuable equipment, in this case spacecraft and key components thereof. In the international

environment of space activities, such measures are intended to enhance the transparency of rights and duties resting, in terms of securities.

Second, the Protocol embodies efforts to increase the coherence of, and, perhaps even harmonize, national regimes, potentially through international intervention in actual disputes on financing and securities. But, as in other cases, national regimes remain the focus of attention, particularly with regard to their definitions of ownership, property rights, and other special rights in space [*91] equipment. Until a protocol successfully overrides substantive national law on such issues, an international regime governing space equipment property rights remains unlikely. Current negotiations, as encapsulated in present draft texts with a plethora of opt-in and opt-out clauses, confirm the marginal likelihood or even feasibility of a comprehensive approach in this field in the near future.

V. FIRMS ARE PRIMARILY CONCERNED WITH PROFITS, NOT PROPERTY RIGHTS

Corporations exist to make profits, and property rights only matter to the extent that they are necessary to fulfill the objective of maximizing profit. Popular literature and the statements of corporate executives gives the impression that unless companies can obtain ownership to space territory, they will not be able to invest in space activities profitably. But in the reasonably near future, no company operating in space will likely need outright ownership of space territory, including land on the moon. Arguments affecting today's businesses about the ownership of space territory only directly apply to businesses currently attempting to sell plots of space territory to unsuspecting citizens, activities directly violating long-standing space treaties.

It is possible to conceive serious business ventures building hotels on the moon, mining resources from the moon and asteroids, and offering other spacebased end-user products. There have been numerous business plans written for these types of ventures, most of which have resulted in little more than paper dreams. However, as space technologies mature, entrepreneurs are becoming more serious about these types of investments.

Meanwhile, some taxing authorities have even attempted to treat currently orbiting satellites as space property that would be taxable in their jurisdiction. For example, a Los Angeles County Assessor recently proposed a tax on eight communications satellites in geostationary orbit owned by Hughes Electronics Corp. n27 Examples of more extreme business activities claiming space territorial ownership include:

. Several people in the 1950s claiming ownership of the moon, sending the declaration of ownership to the United Nations or national governments, with some "selling" lunar territory for one dollar per acre.

[*92.] A 1980 claim by Dennis Hope who is selling an acre on the moon for \$ 19.99, plus \$ 1.51 "lunar tax."

. A claim for the asteroid Eros made by Gregory Nemitz by filing documents in a US district court. n28

Legal certainty is critical here, and it may be gradually but gravely undermined by any such claims advancing without substantial and authoritative opposition. But while "ownership" of a part of the moon may be considered a joke to well-informed space lawyers or many others with proper intuition, the number of people "buying" moon plots has risen to many thousands, and these individuals probably believe that they possess a vested interest in lunar territory, a position that might engender conflicts with prospective private ventures. For example, purported "owners" may decide not to refrain from using their "ownership" rights to stake a claim for minerals extracted from "their" plot, thus stifling bona fide private ventures to undertake mining activities. Some years ago, a few United States companies were seriously investigating opportunities to use Australian territory for return of their unmanned mining expeditions -- and then backed off when finding out that Australia was one of the parties to the Moon Agreement, and thus envisaging a risk that Australian authorities would confiscate any minerals returned from outer space since Australian officials might feel compelled to act under their obligation to adhere to the Common Heritage principle enshrined in the Moon Agreement. As a consequence, now is the time to raise the awareness of the relevant government and other authorities to the appropriateness of undertaking counteractions against such

activities, to serve both legal certainty and a prospective beneficial further development of space activities focused on the moon and other celestial bodies.

When profitable space business ventures are technologically and financially feasible, companies are able to obtain private financing. Billions of dollars were obtained through traditional investment banking houses to fund the very active satellite communications ventures of the late 1990s. These ventures did not involve territorial rights in space as would a venture to perform mining operations on the moon, but they did involve very risky, high up-front capital funds and a long-term commitment to space satellites.

On the near future horizon there are companies such as Scaled Composites (along with Richard Branson's Virgin Galactic), the recent winner of the "X" prize, or Space X who are proposing suborbital human flights (space "tourism") and eventually orbital flights. These innovative and creative firms have found [*93] start-up financing from both private sources and through relatively small government contracts. Assuming that the development plans of these companies continue to achieve technical success, that they avoid catastrophic accidents, and that they can demonstrate a viable business and marketing plan, it is likely they will be able to generate significant private investment funds. n29 However, these commercial activities do not involve property rights issues, at least in the near future. Other business opportunities in space such as orbital manufacturing or orbital energy production also do not directly involve territorial property rights. n30

Firms today with their sights on deep space exploration have far more serious problems than property rights issues. They cannot and will not succeed without passing normal business planning tests. There are several unforgiving aspects to space business ventures. First, the cost of access to space will remain very high -- prohibitive for any type of private activity that requires frequent trips up and back. Second, the resources on the moon or asteroids have to be shown to be valuable enough to either find a way to use them on-site or to return them to earth. This has not been demonstrated as yet. Third, a significant era of research and development will have to take place before the methods of mining, using, and transporting these resources will be perfected and will pass safety and environmental regulations. That era, if it is anything like past ones, will be characterized by government involvement and oversight. This would result in property rights issues being postponed indefinitely until governments are willing to turn over the operations. Also, under government jurisdiction or partnerships, the issues of property rights will be handled by government agencies, not by private entities.

These have to be viewed in the perspective of true business plans and they have to be subjected to careful scrutiny for near or intermediate-term economic prospects. These types of private activities have been proposed many times over the years. Not one has yet resulted in anything more than paper plans.

Second, no private company can operate in space without the consent and regulation of at least one governmental entity because, by treaty, every spacefaring nation has agreed that each government will ultimately be liable for the actions of its citizens. n31 This potential large liability has necessitated a licensing and regulatory system to be established in many nations to protect government funds. Although these systems are not identical in each nation (and some nations [*94] do not have adequate systems in place at the present time), the threat of a large public payout from private activities has resulted in government involvement in every major space nation. Government involvement virtually mandates some form of partnership arrangement with private companies wishing to operate in space and, in today's environment, also means close scrutiny for security reasons.

VI. TERRESTRIAL PROPERTY RIGHTS IN LAND

There are many different forms of property rights, each defined by a nation's culture, history, and political priorities. Ownership over immovable property is not a self-evident phenomenon, defined by natural law or divine intervention; it is a concept provided for by national laws that elaborate it in their own fashion as to all relevant details. Under the old communist legal system prevailing in the Soviet Union and its allies, it was legally impossible for a private person to own immovable property. Similarly, how a private person can come to own real estate, n32 what his rights and obligations are in respect of such real estate, n33 and how he can be disowned in case of overriding public interests, n34 are all determined by the relevant

national law -- and this often in quite different fashion.

In view of the fundamental ties of real estate to territory, also in the international legal sense, such national laws apply exclusively on a territorial basis. Dutch laws on private ownership of immovable property apply to Dutch territory, US laws to US territory, and so on. In other words, national law, and any claim based upon registration under it, is irrelevant with respect to determining possible private ownership of "real estate" on the moon. n35

A full list of the options available to ordinary businesses in handling the property upon which they produce goods and services is beyond the scope of this paper. However, many businesses do not own the land or the buildings they use in production. Beyond outright purchase of the land they can lease the facilities or be part of a condominium arrangement, among other options. Of course, underlying these arrangements, there is a landowner who operates under national laws and can grant exclusive rights. But there are examples of successful business operations in nations that prohibited ownership of land to their [*95] citizens. In the former Soviet Union foreign companies investing in production facilities were guaranteed rights by an intermediary government organization set up for the purpose.

Eventually, when true private business operations are feasible on the moon or on asteroids, there will have to be some form of intermediary established to guarantee the right to use the territory. Debating the form and type of agreements needed for an intermediary should be reserved for the future time, when more is known about the types and value of the space resources in question. Only then can a meaningful arrangement be worked out. Since these potential business ventures are well beyond the five to ten-year normal business planning horizon, there is little need to attack the specifics of such arrangements today.

VII. RELATED ISSUES IN OTHER SECTORS AND TREATIES

A basic premise of the United Nations Treaties is that space should be used for the benefit of all mankind. Since governments were the prime negotiators of these treaties and the only participants in space activities during the 1960s (outside of a few heavily regulated private telecommunications satellites), and since the main thrust of space activity was science and exploration, the anticipated benefits were an expansion of the scientific knowledge base and spin-off technologies. Not much thought was given to serious private enterprise and entrepreneurial activity in space. n36

The preamble to The NASA Act of 1958 (which preceded the above mentioned UN Treaties by nearly ten years) states: "The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." n37 It should be noted that although this was official US policy and theoretically would apply to all US space activities, similar statements do not appear in the legislative charter of other US agencies dealing with space issues. In particular, the security and defense uses of space cannot always be for "peaceful purposes," although those activities still fall well within the Treaty obligations. n38 Until the early 1980s the [*96] US space budget was primarily dominated by NASA. In more recent years, Department of Defense expenditures on space technologies are now greater than NASA's. n39

An extension of the benefits to all mankind principle is the Common Heritage of Mankind. n40 This raises many complex issues since the core of this idea is that all nations should benefit from the knowledge and technology (and profits) generated by using resources in space. Essentially, it is a provision advocated by nations that do not currently have the ability to access these resources on their own and in the application of this idea, richer nations would share with all other nations. Quite naturally, commercial interests in the wealthier nations do not support this since it would mean the sharing of proprietary technology as well as reduce potential profits. Both, they argue, are needed to develop the high-risk/high-reward potential of outer space resources.

Similar issues have been addressed in the past. The Law of the Seas Treaty n41 includes the principles of Common Heritage. The United States only started to consider ratification of this Treaty after a 1994 New York Protocol had de facto considerably changed the originally envisaged elaboration and implementation of Common Heritage while formally maintaining the basic principle. n42 One factor is that potentially

valuable resources have been located in the deep-sea bed and companies are actively developing technologies to mine these resources. The Moon Agreement also incorporates this language. As described above, only a very few nations have ratified this space treaty; none of them are major space-faring nations. Again, there are resources on the moon that may have significant economic value sometime in the future and nations are pressured by their firms to withhold signing away valuable rights. Another similar issue arises with environmental agreements such as the Kyoto Protocol. Although all nations are aware of the necessity to address environmental problems, the United States has not been willing to sign a treaty that will cost its firms significant lost income.

The example of the Antarctic Treaty n43 is mainly relevant with a view to research facilities, since when it comes to commercial exploitation, the situation [*97] has developed in quite a different direction. With the recent Madrid Protocol, n44 the only form of commercial exploitation currently allowed on the continent is that of tourism; all mineral exploitation is completely banned for the next fifty years (counting from the entry into force of the Madrid Protocol in 1998, so the "deadline" here is 2048), and that ban can only be lifted thereafter by complete consent of all the Consultative Parties to the Antarctic Treaty and Madrid Protocol, which includes all important states -- in other words, those who make a substantial effort with respect to the area concerned and are hence entitled, under general international law principles, to a considerably larger voice in determining at the international level an applicable legal regime. n45

The doubtful legal status of Antarctica as it originally arose from the 1959 Treaty (neither *terra communis* since a number of states formally still uphold their claims over sections of the continent, nor part of national territories or *terra nullius*, since a number of other states vehemently do not agree to any such claims) has thus, as far as commercial exploitation is concerned, been overtaken, de facto superseded, or made irrelevant by that ban. Only if a total ban of commercial activities in space would be the aim, therefore, would following the example of Antarctica make sense.

As long as the potential for valuable economic resources on the moon exists and the possibility that private firms can make a business out of using those resources, it is highly unlikely that the major space faring nations will ever agree to a Common Heritage agreement for the moon. The investment and risks involved in getting there and using those resources is just too large to sustain such a business activity without realizing as great as possible future profits. Although governments may continue to develop plans to perform research on the moon under a Common Heritage agreement, companies would not without some assurance of the ability to recover a reasonable return on their investments. The current policy positions of the United States and many other major space-faring nations advocate partnership agreements between governments and private enterprise in future exploration. It is conceivable that governments could agree to subsidize companies for lost profits from a treaty agreement, but given the present budget pressures on space exploration, in practice this will not likely occur.

Sovereignty, therefore, is not the issue. Many ways have been used to overcome the lack of property ownership. Profits are the issue, and unless and until a way of assuring private enterprises that their investments in research and development, equipment, and operations in space can be recovered, the [*98] insecurity and risks of not having an operating mechanism for establishing these rights will impede the fast growth of commercial space. n46

VIII. CONCLUSIONS

There is no particular commercial problem currently or in the foreseeable future where the lack of sovereignty plays a significant role. Current issues, therefore, revolve around two problems: first, the premature concerns and fears of some entrepreneurs, and second, the proper enforcement by governments of fly-by-night organizations that may influence public opinion and set illegal precedents that will be difficult to reverse if not stopped.

When private sector commercial interests are really at stake, there are terrestrial models that can be adopted and agreed upon that retain the principle of lack of sovereignty while providing assurance to firms of the ability to use real property in space and to appropriate profits from the use of the property.

The only serious commercial issue that this conclusion does not directly address is that **space laws** and regulations provide a long-term planning horizon that is stable and predictable. However, the future is not easily predictable, especially for a location as hazardous and hostile as the space environment. And since there are a wide variety of national property laws across the many nations of the world, there clearly is no one set of laws that would or could be evenly applied in space. The ISS is a good example of the delicate negotiations regarding property rights. The solution was to allow each participating nation to apply its own laws to its own modules, a less than ideal compromise in a situation where borders are often not clear

When a company has a product or service that is tested and ready for the market, governments most often find a way to allow it to operate. The Concorde is a good example from the aerospace industry. Here, new technology required many waivers of existing aerospace regulations to be granted. From technical certification issues to environmental concerns, United States and European regulators eventually found a way to grant a certificate of flight-worthiness. Over the twenty-five years of operations, these "waivers" were the mechanism for the Concorde's operations.

Commercial space operations in the future will probably follow a similar path. When a new good or service has evolved beyond the experimental and prototype stages, a method to allow its operation will be negotiated and approved, assuming that safety, environmental, and other issues are satisfactorily [*99] addressed. It is true that this is time-consuming and expensive. However, it may be the only way that a set of acceptable rules can evolve into a workable longterm regime for property rights in space.

FOOTNOTES:

n1 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967), art II, 18 UST 2410, 2413 (1969) (hereinafter Outer Space Treaty).

n2 Id, art VIII.

n3 The Liability Convention imposes absolute liability on the launching state(s) for terrestrial damage from space objects. In addition, the launching state(s) of space objects, including debris, that collide with other space objects and cause damage can be found liable following a showing of negligence. See Convention on International Liability for Damage Caused by Space Objects (1972), art IV, 24 UST 2389, 2393 (1973) (hereinafter Liability Convention). Obviously, problems of identifying the object's owner and proving damage often arise. Also, technical definitions, such as what constitutes a "launching state" present interpretive difficulties. Members of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) are currently working to clarify these issues. For a more detailed recent discussion of the complicated rules on space liability in the United States, see *Liability Risk-Sharing Regime for U.S. Commercial Space Transportation: Study and Analysis*, United States Department of Transportation, Federal Aviation Administration (Apr 2002), available online at <<http://ast.faa.gov/files/pdf/FAALiabilityRiskSharing4-02.pdf>> (visited Feb 19, 2005).

n4 Outer Space Treaty, art VIII (cited in note 1).

n5 See Constitution and Convention of the International Telecommunication Union (1992), art I, 1825 UN Treaty Ser 1, 333 (1998) (hereinafter ITU Constitution); Instrument amending the Constitution and Convention of the International Telecommunication Union, Final Acts of the Plenipotentiary Conference (1994), 1996 Austl Treaty Ser 10.

n6 In the United States, the applicability of various Environmental Protection Acts to federal government and private activities in outer space remains an open question. It bears note that before issuing licenses for commercial space operations, the FAA requires environmental review under the National Environmental Policy Act of 1969, Pub L No 91-190, 83 Stat 852, codified at 42 USC § 4321 (2000). This law is currently applied to impacts on the earth, but the FAA's website does observe that this Act espouses a broad commitment to protect, restore, and enhance the environment. See

<<http://ast.faa.gov/lrra/environmental/ASTBrochurev9021704dks.pdf>>. The National Environmental Policy Act of 1969 also mandates that federal agencies consider the environmental consequences of proposed federal actions. 42 USC § 4321.

n7 Agreement Among the Government of Canada, the Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States Concerning Cooperation on the Civil International Space Station (1998) (hereinafter IGA), in Karl-Heinz Bockstiegel and Marietta Benko, eds, *Space Law: Basic Legal Documents*, D.II.4 (Dordrecht 1990).

n8 *Intellectual Property and the International Space Station: Creation, Use, Transfer, and Ownership and Protection*, National Aeronautics and Space Administration, Office of the General Counsel (Sept 1999), available online at <<http://www.hq.nasa.gov/ogc/iss/>> (visited Feb 19, 2005).

n9 Apart from the Outer Space Treaty, these include: Liability Convention (cited in note 3); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968), 19 UST 7570 (1969) (hereinafter Rescue Agreement); Convention on Registration of Objects Launched into Outer Space (1975), 28 UST 695 (1978) (hereinafter Registration Convention); and Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979), 1363 UN Treaty Ser 3 (1984) (hereinafter Moon Agreement).

n10 Outer Space Treaty, art II (cited in note 1).

n11 States are liable if they qualify as "launching State(s)" under Art I(c) of the Liability Convention, which provides the following definition "(i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched." Liability Convention, art I(c) (cited in note 3). Whether "[a] State which launches or procures the launching of a space object" includes a state whose citizens undertake an action in space depends critically on the circumstances; the mere fact of a citizen being active in space and thereby causing damage does not attach liability to the state of which that individual is a citizen, at least according to the Liability Convention. In the United States, the test of whether a company must procure a license from the FAA prior to a launch is based not on any particular percentage of ownership, but on the more subjective basis of having a controlling interest in the business venture. 49 USC § 70102.1(c). The full text of Chapter 701 (Commercial Space Launch Activities) is available online at <<http://ast.faa.gov/aboutast/701complete.htm>> (visited on Mar 25, 2005).

n12 Germany, France, Belgium, and the Netherlands are currently going through the process of writing **space laws**. See, for example, F.G. von der Dunk, *Current and Future Development of National Space Law and Policy*, discussion paper presented at the United Nations/Brazil Workshop on **Space Law**, Rio de Janeiro (Nov 22 -- 25, 2004), pending publication by the United Nations Office for Outer Space Affairs, Vienna (forthcoming 2005).

n13 The Outer Space Treaty applies, strictly speaking, to the "exploration and use" of outer space, not to outer space as such, although only a fine line distinguishes the two concepts. See Outer Space Treaty, art I (cited in note 1).

n14 A summary of these arguments can be found in Lotta Viikari, *From Manganese Nodules to Lunar Regolith*, (Publications of the Faculty of Law, University of Lapland, D Series, Rovaniemi 2002).

n15 Moon Agreement, art 4(1) (cited in note 9). This treaty applies, in strict terms, to "the moon and its natural resources." Id, art 11(1).

n16 See, for example, ITU Constitution, art 45 (cited in note 5).

n17 Id, art 44. It may be noted, that in view of their particular nature, for Geostationary ("GEO") satellites the term "orbital slot" was coined, whereas for Medium Earth Orbits ("MEO") and Low Earth Orbits ("LEO") the terms "orbits" or "orbital planes" are more appropriate. ITU authority in the field of

coordination of orbits and orbital planes for MEO and LEO is less unequivocal than for GEO, though it has been now succinctly introduced into the text of art 44.

n18 Thus, for patent rights already in 1883, the Convention for the Protection of Industrial Property, as revised (1967), 21 UST 1583 (1970) (hereinafter Paris Convention), with currently over 140 states parties; and similarly for copyrights, in 1886, the Berne Convention for the Protection of Literary and Artistic Works, as revised (1979), S Treaty Doc No 99-27 (1986) (hereinafter Berne Convention), with currently about 130 states parties, was concluded.

n19 Convention Establishing the World Intellectual Property Organisation (WIPO) (1967), 21 UST 1749 (1970) (hereinafter WIPO Convention). For example, updating the Universal Copyright Convention, as revised Universal Copyright Convention (UCC), 25 UST 1341 (1971); updating the Paris Convention, 21 UST 1583 (cited in note 18); and drafting the Patent Cooperation Treaty (1970), 28 UST 7645 (1979); the Trademark Law Treaty (1994), 1998 Austl Treaty Ser 3, and the Copyright Treaty (1996), 36 ILM 65 (1997).

n20 Notably, the US has done so by adding § 105, "Inventions in outer space," to the Patents in Outer Space Act, Pub L No 101-580, 104 Stat 2863 (1990), codified at 35 USC § 10 (2000).

n21 See IGA (cited in note 7).

n22 Only Germany has thus far actually undertaken the relevant efforts and extended the scope of its national patent protection to inventions made on board the ESA module. See European Space Agency, *International Space Station Legal Framework*, available online at <http://www.esa.int/export/esaHS/ESAH700VMOC_iss_0.html> (visited Feb 22, 2005).

n23 See the brief discussion on art II of the Outer Space Treaty in section III of this article.

n24 See Liability Convention, arts II, III (cited in note 3). Moreover, damage recompensable under the Convention is limited to "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations." Id, art I(a).

n25 The term "launching State" means: "(i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched." Id, art I(c).

n26 Convention on International Interests in Mobile Equipment (2001), ICAO Doc 9793 (Nov 16, 2001), available online at <<http://www.unidroit.org/english/conventions/mobileequipment/mobile-equipment.pdf>> (visited Feb 20, 2005) (hereinafter Capetown Convention); Preliminary Draft Protocol on Matters Specific to Space Assets, UNIDROIT 2003 CGE Space Pr/1/WP 3, vi, available online at <<http://www.unidroit.org/english/workprogramme/study072/study072j/72j-13rev-e.pdf>> (visited Feb 19, 2005).

n27 *Assessor Loses Latest Bid to Tax Satellites*, LA Times B6 (Sept 28, 2001). Proponents of the tax argued that because Hughes was located in California, the satellites were movable property currently located out of state, much like heavy construction equipment subject to taxation. However, the California State Board of Equalization ruled that the satellites were not launched from California, do not fly over California, nor will they ever return to California, and therefore should not be taxed as California property.

n28 Margie Wylie, *Questions of Property Rights May Bedevil Private Ventures in Space*, Newhouse News Service (Feb 11, 2004), available online at <<http://www.newhousenews.com/archive/wylie021204.html>> (visited Feb 19, 2005).

n29 This is not a foregone conclusion. A number of firms receiving financing have discovered that their capital needs far surpass original projections and/or that their estimate of the market for space activities has far exceeded the actual market.

n30 See, for example, Sam Dinkin, *Don't Wait for Property Rights*, *The Space Review* (July 12, 2004), available online at <<http://www.thespacereview.com/article/179/1>> (visited Feb 22, 2005).

n31 Liability Convention, arts II, III (cited in note 3).

n32 For example, by depositing a claim that goes unchallenged for a specified period of time, or by inheriting a relevant document.

n33 For example, valuable minerals or historical treasures found on immovable property; compare the concepts of "right of way" and "private passage," which sometimes rest upon real estate.

n34 For example, when a high-speed railway line or motorway needs to be built. Substantive law in this area includes procedural rules and entitlement to compensation.

n35 See Vienna Convention on the Law of Treaties (1969), art 27, 1155 UN Treaty Ser 331 (1980).

n36 Although the compromise clause creating governmental liability for the actions of its citizens in space was drafted in response to Soviet opposition to the involvement of private firms in space activities. See Carl Q. Christol, *Development of Current Outer Space Law*, Symposium on Commercial Opportunities in Space: Roles of Developing Countries, Taipei, Taiwan, China (Apr 21, 1987).

n37 National Aeronautics and Space Act of 1958, § 102(a), Pub L No 85-568, 72 Stat 426, codified at 42 USC § 2451 (2000).

n38 The Treaties prohibit nonpeaceful uses of space as well as weapons of mass destruction in space. But using space for observations, communications, and other activities that have dual purposes is not a violation of the provisions.

n39 NASA, Aeronautics and Space Report of the President, FY 2003, Appendix E-1A, 139.

n40 See section III of this article.

n41 United Nations Convention on the Law of the Sea (1982), 1833 UN Treaty Ser 3, 397 preamble (1994).

n42 See Ambassador Sichan Siv, US Representative on the United Nations Economic and Social Council, Statement in the General Assembly on Oceans and Law of the Sea, Statement on Oceans and Law of the Sea (Nov 27, 2001), available online at <<http://www.state.gov/g/oes/rls/rm/6796.htm>> (visited Feb 21, 2005).

n43 Antarctic Treaty (1959), 12 UST 794 (1962).

n44 Protocol on Environmental Protection to the Antarctic Treaty (1991), art 7, 30 ILM 1455, 1464 (hereinafter Madrid Protocol).

n45 *Id.*, art 25.

n46 Of course, having those rights does not guarantee a profit or even that a private investment will be made. It only removes one additional risk factor from the equation. In fact, there are many far more significant financial, technical, and environmental problems with private space activity.

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