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Human Activities in Space: Issues and Framework of the United States Law Concerning Outer Space

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By David Liechty
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A space-based economy will grow within a legal and regulatory framework for human activities in space. To help our subscribers and readers understand the current state of law in the U.S. jurisdiction, we asked attorney David Liechty to prepare on overview. As we watch the global growth in space investment, this is an invaluable introduction to some of the most important legal issues facing mankind.]

The Eisenhower administration's decision to tacitly allow the USSR's Sputnik I satellite to pass over US sovereign airspace in 1957 indicated that the challenges and opportunities afforded by outer space would require a new legal approach. The United States and the international community developed a body of domestic law and entered into various international agreements at that time to govern human activity in outer space.

Over the intervening years, the legal landscape has slowly been refined and expanded to accommodate subsequent advances in space-related activities and technology. However these changes to the legal framework have not kept pace with the speed of development in actual and potential space activity, leading to significant gaps and issues in the national and international legal landscape. This overview article will discuss key laws and treaties that form the framework governing United States civil, commercial, and military activities in space and will identify and discuss some of the many challenges that need to be addressed to adequately lay the foundation for continued progress in the evolution of space activities.

Catherine Austin Fitts, The Solari Report, October 2015

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I. The Framework of United States Law Concerning Outer Space

A. 1958 US National Aeronautics and Space Act

With the launch of Sputnik I, and as a result of the then-prevalent Cold War mentality, the U.S. Congress saw a potential "credible" threat of attack on U.S. national territory, and moved quickly to create an infrastructure that could counter this threat. [1] In 1958, it passed the National Aeronautics and Space Act ("NAS Act").[2] With significant input from civilian sources, Congress was persuaded that the potential for peaceful activities in space would far outweigh that for military activities,[3] and in the NAS Act, it declared the nation's policy "that activities in space should be devoted to peaceful purposes for the benefit of all

mankind."[4] Following this policy, the NAS Act placed "control over aeronautical and space activities sponsored by the United States"[5] primarily in the hands of a civilian-led agency, the National Aeronautics and Space Administration[6] ("NASA").

The NAS Act did, however, carve out an exception to this control, for "[aeronautical and space] activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States,"[7] which it granted to the Department of Defense ("DOD"). The NAS Act further required NASA and the DOD to "advise and consult with each other" and to "keep each other fully and currently informed" with respect to activities in their respective jurisdictions,[8] except where one or the other concludes that it would be adverse to their responsibilities, and the President concurs.[9]

In keeping with the civilian-led tone of the NAS Act, President Dwight D. Eisenhower transferred, by executive order, the bulk of the DOD's civilian personnel, property, and funds related to space activities to NASA in 1958.[10] Since that time, the relative budgets and relationships between the U.S. civilian and military space programs have "ebbed and flowed."[11] NASA's reported fiscal year ("FY") 2014 budget for space activities was $17.7 billion, versus DOD's reported FY2014 budget of $10.4 billion, however, as recently as FY2012, DOD's reported budget was $26.7 billion, which was larger than NASA's reported $17.8 billion budget.[12] The reported DOD budget is thought to represent its full budget for both classified and unclassified space programs.[13]

B. 1962 US Commercial Communications Satellite Act

In 1962, Congress passed the Communications Satellite Act (Comsat Act)[14], which brought the U.S. into international cooperation in the realm of satellite communication technology. It allowed for U.S. participation in the international communication satellite effort, Intelsat. This multinational undertaking was tasked with "providing] a legal, administrative, and technological system under which participating countries could access portions of the [electromagnetic] spectrum for use within their nations."[15] For member nations, Intelsat maintains a monopoly over the distribution of electromagnetic spectrum wavelengths.

C. 1967 United Nations "Outer Space Treaty"

The United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("UN Outer Space Treaty" or "UNOST") entered into force in 1967.[16] This treaty is the basic framework for international space law, and sets forward the following guiding principles for countries engaged in outer space activities (including activities on the moon or "other celestial bodies"):

1. **Province of all mankind:** All countries are free to explore, use, and perform scientific research in outer space, and all exploration and use "shall be … for the benefit and in the interests of all countries.[17]
2. **Non-appropriation:** Countries cannot appropriate property rights in outer space (including on or in "celestial bodies") "by claim of sovereignty, by means

of use or occupation, or by any other means."[18]

3. **Governing law:** The activities of signatory parties in outer space will be carried out in line with international law, including the UN Charter.[19]
4. **WMDs:** Signatory countries will not place nuclear weapons or other weapons of mass destruction in orbit or station them in outer space in any other manner.[20]
5. **Military:** Signatory countries will not establish military installations, test weapons, or conduct military maneuvers on the moon or on other celestial bodies. Military personnel may be used in peaceful activities and countries may establish civilian research bases.[21]
6. **Mutual assistance:** Signatory countries will give "all possible assistance" to astronauts landing in sovereign territory on Earth, astronauts from one party country will assist those from another party country in carrying out activities in space, and perceived dangers to astronauts are to be reported.[22]
7. **National responsibility for activities in space:** Signatory countries bear responsibility for national activities in space, whether by governmental or non-governmental entities, bear responsibility for conformity of these activities with the UNOST, and are responsible for authorizing and overseeing non-governmental activities in outer space.[23]
8. **Liability:** Both signatory countries that launch objects into space and those signatory countries from whose territory or bases the objects are launched (if different) are liable for damage to other signatory countries or their people from the launched objects.[24]
9. **Jurisdiction:** Signatory countries retain jurisdiction over objects carried on its registry and related personnel while they are in outer space.[25]
10. **Ownership:** Ownership of launched objects, objects landed or constructed on a celestial body, or the component parts of these objects, is not affected by entry into outer space or by return to Earth.[26]
11. **Scientific Research:** Signatory parties are to pursue research and exploration in outer space in a manner that avoids "harmful contamination" of celestial bodies and "adverse changes" in Earth's environment from introduction of "extraterrestrial matter."[27] Signatory countries will adopt appropriate measures to ensure compliance.[28] Signatory parties will also consult with one another to avoid harmful interference with each other's activities.[29]
12. **Sharing of information:** Signatory will consider requests by other signatory parties to observe flight of objects launched,[30] report the research and results of scientific investigations,[31] and reciprocally allow representatives of other signatory countries to visit stations, installations, equipment, and vehicles on celestial bodies.

Subsequent United Nations treaties and agreements expanded on and further refined specific aspects of this framework treaty.

D. 1968 United Nations "Rescue Agreement"

The UN Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of

Objects Launched into Outer Space (the "UN Rescue Agreement") entered into force in 1968 and expanded on UNOST Articles V and VIII. [32] It provides further detail on the specific expectations for assistance in returning astronauts and launched objects to their countries of origin.

E. 1972 United Nations "Liability Convention"

The UN Convention on International Liability for Damage Caused by Space Objects (the "UN Liability Convention") entered into force in 1972 and expanded on UNOST Article VII.[33] This convention further delineates the circumstances under which signatory countries are liable for damage from objects launched into outer space. This convention includes the following specific provisions:

1. There is strict liability for damage caused by launching countries (or persons for which they are responsible) to other countries' property or persons located on the surface of the Earth or to their flying aircraft.[34]
2. A finding of fault is required to show liability for damage caused by launching countries (or persons for which they are responsible) to other countries' launched objects, persons, or property located above the surface of the Earth.[35]
3. Where the activities of two different countries causes damage to a third country, the first two countries are jointly and severally liable – with compensation split based on the degree of fault.[36]
4. Countries jointly launching objects into space are jointly and severally liable for any damage from the launched objects.[37] Similarly, signatory countries that are members of an international intergovernmental organization, such as the European Space Agency, are also jointly and severally liable for damage caused by joint activity.[38]
5. Strict liability does not apply if the damage resulted from acts, omissions, or gross negligence of the damaged country or its persons unless the country causing damage did conform with provisions of international law.[39]
6. The Liability Convention's provisions do not apply to damage caused to nationals of the launching country or foreign nationals participating in the launch, operation, or recovery of the object.[40]
7. Only signatory countries may bring claims under the Liability Convention, and they must present those claims to the offending country through diplomatic channels.[41]
8. The Liability Convention's provisions do not preclude a country or an individual that might be represented by that country from pursuing a claim in the courts of the launching country.[42]

Being a framework of international law and primarily governing actions of nation-states, the Liability Convention has limited direct applicability to individuals and entities damaged by either their own or other countries' launches or activities in outer space.

F. 1976 United Nations "Registration Convention"

The UN Convention on Registration of Objects Launched into Outer Space (the "UN

Registration Convention") entered into force in 1976.[43] This convention put in place a mechanism for the identification of launched objects in outer space, which is a necessary component for proving liability claims. The UN Registration Convention includes the following specific provisions:

1. "Launching countries" include a country that launches or "procures" the launch of an object, and the country from whose territory the object is launched, if different.[44]
2. "Launched objects" include the object's launch vehicle and the component parts of both the launched object and the launch vehicle.[45]
3. Launching countries must maintain a registry of launched objects[46] and must provide certain basic identifying information concerning each launched object and its orbital parameters to the UN Secretary-General,[47] to be maintained on a UN registry.[48]
4. Launching countries are to notify the UN Secretary-General when registered objects are not actually placed in orbit or are no longer in orbit around the earth.[49]
5. When a damage-causing object cannot be identified using the registries, launching countries will cooperate and assist in identifying the object.[50]

The UN Registration Convention was put into place to create a mechanism by which ownership of launched objects could be more easily identified and liability for damage from these objects could be more easily assigned.

G. 1984 United Nations "Moon Agreement"

Although the UN Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the "UN Moon Agreement") entered into force in 1984 with Austria's ratification,[51] relatively few countries have signed and/or ratified the agreement.[52] The United States government has not signed this agreement, nor has Russia, China, Japan, or most of the countries involved in the European Space Agency. The agreement is not binding on non-signatory countries, but it has been adopted by the UN General Assembly, and it gives a strong indication of the direction in which international law is aimed with regard to activities on "celestial bodies" in our solar system, including the moon, Mars, and asteroids. Conversely, the fact that it has not been ratified by many nations may be seen as a repudiation of the principles in it, where these differ from the other UN space law agreements.

The Moon Agreement includes restatements of many of the principles set forward in the UNOST, but provides further clarification and elaboration on these principles, including the following:

1. **Definition** – The word "moon" when used in the agreement includes all "other celestial bodies within the solar system" (including asteroids, Mars, and other planets). [53]
2. **Military activity and force** – In addition to the restatement of prohibitions against placement of nuclear weapons, weapons testing, and military

installations and maneuvers, the UN Moon Agreement specifically forbids the use of force or hostile acts on the moon and the threat of force or hostile acts.[54]

3. **Scientific research** – Signatory countries may freely undertake scientific research activities[55] on or below the surface of the moon,[56] so long as the scientific research activities of other countries is not impeded.[57]
4. **Resource use for scientific investigation** – Signatory countries may collect samples of moon substances for scientific research purposes and may use minerals and other available substances to support their missions. [58]
5. **Environmental considerations** – Signatory countries must take measures "to prevent the disruption of the existing balance of [the moon's] environment," avoiding contamination and introduction of "adverse changes" in the environment, and must advise the Secretary-General of the adopted measures.[59] Signatory countries must also inform the Secretary-General of any radioactive materials placed on the moon.
6. **Civilian bases** – Signatory countries may establish manned and unmanned stations on the moon, may only use the area of land required for the needs of the station, and must immediately inform the Secretary-General of the location and purposes of the station.[60]
7. **Assistance to persons on the moon** – Signatory countries must regard "any person on the moon as an astronaut [under] article V of the [UNOST]," and as part of the crew of a spacecraft under the UN Rescue Agreement, and must provide shelter to persons in distress on the moon.[61]
8. **Ownership of natural resources** – No celestial object or part of a celestial object, including natural resources, can become the property of any country, entity, or person, and the placement of vehicles, stations, etc., does not create a right of ownership in the surface or subsurface.[62]
9. **International regime for natural resource exploitation** – When exploitation of natural resources on the moon "is about to become feasible," signatory states will create an international regime to govern exploitation of these natural resources.[63] This international regime will be guided by specific principles, including safe development, rational management, and equitable sharing by all signatory countries in the benefits derived from the resource exploitation.[64]
10. **Reporting of natural resource discoveries** – To facilitate the purposes of the international regime, signatory countries are to report discoveries of natural resources to the Secretary-General.[65]
11. **Regulation of activities** – The UN Moon Agreement reiterates the responsibility for signatory countries to regulate and supervise the activities of entities under their jurisdiction.
12. **Liability** – The UN Moon Agreement also reiterates signatory countries' liability for actions of entities under their jurisdiction, and it also indicates that as activity on the moon increases, provisions on liability will need to become more detailed.

The overall sense of the agreement appears to be a restatement that the moon and other celestial bodies are the common heritage of all mankind, and that their exploration and use should be carried out in a peaceful manner and so that all people living on Earth will benefit.

H. Additional United States National Law

Beginning in 1984 with the Commercial Space Launch Act[66] and the Land Remote-Sensing Commercialization Act,[67] Congress over time produced a significant body of national domestic law that regulated not only governmental agency activity, but also activities of commercial actors in outer space.[68] In 2009 this body of law, which had been spread among various sections of the United States Code, was pulled together into Title 51 – National and Commercial Space Programs. Title 51 of the United States Code includes laws governing NASA,[69] space-related scientific research,[70] commercial opportunities,[71] earth observations (remote sensing),[72] and "access to space"[73] – which includes the International Space Station ("ISS"). These laws were enacted, at least in part, to fulfill the United States' responsibilities under the UNOST and subsequent UN agreements, as outlined above, and to regulate and apportion its liability for damage.

In 2010, Congress passed the National Aeronautics and Space Administration Authorization Act of 2010,[74] which retired the Space Shuttle and called for a dual-track program of civil government and commercial development in launch capabilities and delivery of astronauts to the ISS.[75] While the resulting Commercial Crew and Commercial Cargo programs envision reliance on space entrepreneurs to ferry astronauts to and from the ISS while NASA builds its own capabilities, US astronauts have primarily been passengers on Russian rockets.[76]

I. U.S. State Law Related to Space

In addition to United States national law, a growing body of U.S. state law has developed in recent years. These laws vary from state to state, but all involve various incentives to attract aerospace companies, and in particular emerging commercial space transportation companies. These incentives include typical financial incentives, such as lowered taxes and infrastructure assistance, but also include legal frameworks that help remove ambiguity as to how specific provisions of national and international law will affect these companies. For example, Virginia's 2008 Zero G Zero Tax Act gives tax exemptions for certain space launch-related business activities.[77] In contrast, Virginia's 2007 Space Flight Liability and Immunity Act[78] extends the FAA's regulations on informed consent and further clarifies the limits on liability to companies providing human spaceflight. The Federal Aviation Administration's publication State Support for Commercial Space Activities identifies seventeen states that have enacted some legislation relating to aerospace business development. [79]

II. Overview of Important Issues in Space Law

Multiple important issues face individuals, governments, and non-governmental entities in areas governed or touched by space law. These issues stem primarily from the framework nature of current international and U.S. domestic space law and the relatively rapid technological development regarding activities in space. To enable, nurture, and allow what truly is a nascent industry to grow and possibly flourish, the following are some of the legal challenges that need to be met and resolved.

A. Natural resource exploitation

Because of the extremely high costs involved in building and successfully launching objects into space, extracting resources has become a high-profile potential activity, as it gives the possibility of reaping a return on investment and ultimately lowering the costs of activities in space. However, in addition to the technological hurdles that must be overcome, there are multiple legal issues that must be resolved.

The most important legal issue for natural resource exploitation is the issue of property rights and the ability of private commercial actors to own resources in outer space. As indicated above, the UNOST expressly states that countries may not appropriate "outer space, including the Moon and other celestial bodies ... by any ... means."[80] There is debate as to the applicability of this provision to private commercial actors, but the international consensus is that under the current space law regime outer space is not subject to appropriation by nongovernmental actors.[81] This interpretation has found support in a U.S. Department of State letter to a private U.S. commercial enterprise claiming ownership of an asteroid (in which the Department of State representative indicated that "private ownership of an asteroid is precluded by Article II of the [UNOST]")[82] and in a U.S. District Court ruling that the UNOST prohibits private appropriations in outer space.[83]

As the capabilities for actually mining asteroids, the moon, and other planets further develops, however, pressure will only build for individual countries and the international community as a whole to clarify this issue and develop appropriate regulations. The 1984 UN Moon Agreement, which reasserts the common heritage of mankind in using outer space, also asserts that an international regime needs to be put in place to govern and ensure equitable distribution of the benefits of resource extraction.[84] However, since the Moon Agreement is viewed as being an empty agreement and not in force, this provision is no more than a non-binding statement of principle. States signatory to the UNOST could opt for national legislation that interprets the UNOST as allowing private commercial ownership of resources in outer space, and the United States Congress has introduced a number of bills which appear to follow this interpretation.[85] However, even if such legislation was carefully drafted, it would most certainly go against international opinion and could have significant geopolitical consequences. Disregarding or appearing to disregard the UNOST could possibly disrupt the current space law regime and lead to significant additional challenges and tensions, especially with the promised benefits of mining in outer space at stake.

B. Environmental Contamination

The recent discovery of sizeable amounts of saline water on Mars[86] has highlighted a challenge for scientific research in outer space that will soon also apply to commercial activities, such as mining. As indicated above, the UNOST requires that signatory countries conduct their outer space activities "so as to avoid ... harmful contamination" of the moon and other celestial bodies.[87] The UNOST further requires signatory countries to "adopt appropriate measures for this purpose,"[88] and the UN Committee on Space Research ("COSPAR") is responsible for setting standards and protocols, which signatory countries follow.[89] One of the standards set by COSPAR involves "Special Regions" it has designated on Mars, where conditions are such that they could possibly support life.[90] These Special Regions include the areas where liquid water has been discovered.

The challenge that is highlighted by the discovery of water on Mars by the U.S. Curiosity rover lies in the standards set by COSPAR for space vehicles entering areas where life may exist. The Curiosity rover was designed for COSPAR category IVb missions, which have extremely strict cleanliness requirements; however, the Special Regions require vehicles designed for category IVc missions, which must be even cleaner.[91] The resilience of Earth bacteria, which have been found to survive the harsh conditions of spaceflight, make category IVb landers unsuitable for exploration in Special Regions. Bacteria located on the surface of landing vehicles could find conditions in Special Regions favorable enough to thrive, thus contaminating the areas with Earth-sourced bacteria.

While scientists and policy experts grapple with questions of Martian radiation levels possibly killing the bacteria (thus rendering the question moot), this underscores the extreme seriousness with which possible environmental contamination in outer space is taken.

C. Commercial Human Spaceflight

In the emerging arena of private commercial human spaceflight, a number of issues are pertinent. Primary among these is the issue of allocation of risk and liability and the provision of insurance, without which the potential costs and liabilities of commercial human spaceflight will be prohibitively expensive.[92]

The United States federal government, as signatory to the UNOST and the UN Liability Convention, bears ultimate responsibility for damage from activities of individuals and commercial entities under its jurisdiction.[93] The provisions in these documents apply expressly to foreign nationals, however, and do not apply to U.S. nationals.[94] The U.S. has taken initial steps on a federal level toward filling the existing liability gap by introducing regulations under the 2004 Commercial Space Launch Act Amendments that require informational disclosures to be made by suborbital flight operators in order to obtain the informed consent of private customers.[95] Although commercial suborbital flight does not have enough of a record to clearly establish what information is sufficient to disclose to meet the federal requirement, it is clear that the U.S. government is attempting to introduce a “risk-shifting” regime between the operator and the customer that will help curb the potential exposure of commercial enterprises.[96] Similarly, as indicated above, various state governments in the United States have also enacted liability provisions to cover human spaceflight. Given that foreign nationals may make up a significant number of the customers on commercial human spaceflights, however, it is possible that the U.S. federal government may utilize the doctrine of preemption and impose its own regulations. At any rate, there exists a need for greater clarification in the area of liability and insurance.

A related set of issues relevant to commercial human spaceflight involves regulation and oversight of the infrastructure and vehicles utilized for this purpose. At present, U.S. states are approaching the operation and oversight of commercial spaceports as they have airports, which will lead to typical relationships between local, state, and federal authorities.[97] The federal government’s obligations to supervise all U.S. nongovernmental space activity[98] may, however, require application of the doctrine of preemption in this area as well. Similarly, as technological advances continue in commercial spacecraft, which are

currently legally defined as “rockets,” the definitional lines drawn between aircraft and rockets may blur significantly, and it may be more pertinent to consider regulation of the industry by international aviation law, rather than national space law.[99] Safety and licensing regulations for private commercial spacecraft, which have begun to be created by the Federal Aviation Administration,[100] also need to be more fully developed.

Given the extreme potential dangers inherent in spaceflight and exploration, the environment and experience of which have few parallels to our terrestrial environment, individuals undertaking space exploration (and tourism) require a greater level of cooperation from other actors in space. The UNOST reflects this need by stating that “astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties,”[101] and both the UNOST and the UN Rescue Agreement require assistance to astronauts landing or in distress on the Earth. However, the applicability of these provisions to private individuals is not clear, and the potential liabilities for assisting private individuals in these circumstances is likewise unclear. While the Moon Agreement includes a broader category of “persons,” rather than “astronauts,”[102] this agreement is not in force. A formal expansion of the definition of “astronaut” and/or a clarification of the responsibilities, expectations, and burdens toward private spacefarers is needed.[103]

An additional issue related to commercial human spaceflight arises from the requirement for each signatory country to create its own regulatory regime to implement oversight and licensing of activities in space. The potential variability in regulatory regimes could lead to use of “flags of convenience,”[104] where spacecraft and tourism operations would be registered, launched, and operated from jurisdictions with relatively soft safety and liability provisions, as often occurs in the commercial shipping industry. This could easily also apply to the launch of other types of objects, including commercial satellites, as more jurisdictions achieve launch capabilities. Additionally, there are currently a number of countries that are not signatories to the UNOST, and as commercial space activity becomes a more distinct possibility, the potential exists for private entities to fund launch capabilities in non-signatory countries. This could lead to objects and entities in space operating outside the UN space law framework, including private operations disregarding international legal norms and principles.

D. Orbital Debris

There is a massive amount of man-made debris orbiting the Earth. The number of objects greater than 1 centimeter in Low-Earth Orbit (altitudes up to 2,000 km above the Earth’s surface) is more than 300,000[105] but the U.S. Air Force is only able to track approximately 23,000 of these objects.[106] Approximately 1,300 of the objects are active satellites[107] and under control, with the remainder categorized as debris. At orbital velocities, damage from collisions with objects larger than 10 centimeters is “potentially catastrophic,” and damage from objects as small as 1 centimeter “can disable or disrupt a mission”[108] and would be deadly to exposed astronauts.[109] The International Space Station must often be moved to avoid tracked orbital debris, with astronauts taking refuge in lifeboats, as happened in July 2015.[110] Satellites are also in danger of being hit and damaged by untracked orbital debris.[111]

Orbital debris is primarily of man-made origin and includes non-functional satellites and other spacecraft, abandoned launch vehicle stages, mission-related equipment, and fragments resulting from satellite collisions and past U.S., Russian, and Chinese missile tests.[112] Under the UNOST, ownership of "objects launched into outer space … and their component parts is not affected by their presence in outer space,"[113] and therefore, every piece of man-made orbital debris is the property of some country, and likely a signatory to the UNOST. Further, a signatory country that owns a piece of orbital debris is liable under the UNOST for damage done to any other country's property.[114] In reality, though, it may be impossible to allocate liability for particular damage from space debris given the difficulty in identifying the actual owner of the debris.[115] A legal regime that takes this into account and somehow apportions liability for damage fairly, or an insurer willing to underwrite the risk of damage, may be necessary for continued space activity as the amount of debris increases.

Similarly, although innovative and creative means have been conceived for collecting orbital debris,[116] the fact remains that each bit of debris is technically already owned, and its removal by any other actor would be a violation of current international space law. To give proper incentives for private commercial or governmental efforts to remove space debris, a system analogous to maritime salvage law would need to be put into place.

E. Additional Issues Related to Satellites

Increased private commercial use of satellites and increased cross-border business activities related to space have exposed an unforeseen gap in the UN space law system related to transfer of private ownership in satellites in orbit.[117] Because the UNOST places jurisdiction, oversight, and liability for damage from a launched object on the launching country, an issue arises when ownership of the launched object is transferred to an entity in a different country. Under the UN system, responsibility for the launched object remains with the launching country, even though it may not be able to exercise control over the object.
A second set of issues dealing with satellites involves the International Telecommunication Union ("ITU"), which is the UN agency tasked with allocating radio spectrum and satellite orbits globally. The first is the problem of speculative filings, or "paper satellites." When an entity desires to launch a satellite, it must register with its country and request the country to obtain a position on the ITU Master International Frequency Register. Securing a position on the ITU register becomes an asset in itself, and if the entity delays actual launch or secures the position solely on a speculative basis, it can lead to delays in bringing other technologies to market, as the number of orbit positions is finite.[118] Regulations to ensure administrative due diligence in discovering a genuine intention to launch would help lessen inefficiencies in the ITU register. The second, related issue involves a suggestion for the development of a mechanism whereby ITU filings can be transferred between member countries, which would help facilitate expansion and development in the satellite industry.[119]

F. Militarization of Space

The UN system of space law does restrict some military activity in space, including placement of nuclear weapons in space and weapons testing, maneuvers, and military bases on the surface of planets. However, there are many potential aspects of military action and use of force that are not covered.[120] Transit of weapons through space, launch of

weapons into space from Earth, and use of satellite technology, anti-satellite weaponry, and standard military weapons in space, are all aspects of military action that are not addressed in the UN system.[121] As space warfare becomes more of a real possibility, international norms and agreements may need to be developed. The incredible dependence of modern society on satellite technology and the increasing capacities of many countries to threaten this infrastructure (such as Chinese missile test in 2007) makes the need for a cautionary approach critical.[122]

The dual military and civilian nature of most technologies utilized in space also creates a difficulty in that regulation of the militarization of space could potentially hinder critical civilian technological development.[123] A related issue for private space companies in the United States is that all spacecraft, including satellites, are classified as "defense articles" on the United States Munitions List, and transfer of technology to foreign countries is tightly regulated under the International Traffic in Arms Regulations.[124] This puts U.S. companies at a disadvantage in the global marketplace. One suggestion for remedying this challenge is to move non-military spacecraft from this list and on to the less-restrictive Commercial Control List maintained by the Commerce Department.[125]

G. Law Enforcement

The international nature of space law as it has developed since the orbit of Sputnik I raises numerous jurisdictional questions. In the UN framework, signatory countries have ownership and therefore jurisdiction over objects launched and research bases established, but most of outer space cannot be appropriated and it remains in the international domain. Accordingly, questions of jurisdiction relating to crimes committed in outer space will need to be resolved, among other related issues.

A prime example of the challenges faced by law enforcement in space can be seen in the development and launch of satellites for secure storage of bitcoin encryption keys in orbit.[126] This one example raises questions of the possibilities of money laundering, space as the ultimate off-shore haven, and the responsibility for policing and protecting space-based assets, both real and financial. Practically speaking, as far as actual policing goes, the United States Space Command would probably take the lead, even though the UN might have formal responsibility.[127]

H. Integrating Other Areas of Law

The UN space law framework does not exist in a vacuum, and this has both facilitated and caused challenges for its continuing development. The growing number of countries, entities, and individuals involved in space activities has increased the diversity of interests, often conflicting, in the use and exploitation of space, which has caused challenges for the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), tasked with developing international space law.[128] A growing disconnect between the commercial space industry and UNCOPUOS has also created similar difficulties.[129] A clear example of this can be found in the commercial satellite industry's unkind view toward the Space Assets Protocol, which is seen as simply adding layers of unnecessary regulations onto an already working set of laws relating to granting of security in space-based assets.[130] Other well-developed areas of law that relate to and inform space law include telecommunications law, patent law,

environmental law, and emerging telemedicine law.

III. Conclusion

The United Nations space law regime, together with the US's implementing legislation and supplemental legislation at the national and state levels, has created a framework of laws that have helped foster the development of the space industry. Many gaps and challenges exist in this framework that must be addressed in order to support its continued development.

Notes

1 See Joanne Irene Gabrynowicz, One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues, 4 Harv. L. & Pol. Rev. 405, 406 (2010) (available at http://joannegabrynowicz.com/wp-content/uploads/2013/11/2010-Gabrynowicz-HLPR-4.2-405-426-US-Space-Law.pdf).

2 National Aeronautics and Space Act of 1958, Public Law #85-568, 72 Stat., 426 (located at http://history.nasa.gov/spaceact.html) ("NAS Act")

3 Gabrynowicz, supra., at 408, (citing Press Release, NASA, Eilene Galloway, the Woman Who Helped Create NASA, Dies at Age 102 (May 4, 2009), available at http://www.nasa.gov/topics/history/features/galloway_obit.html)

4 NAS Act, sec 102(a)

5 id., sec 102(b)

6 id., sec 202(a)

7 id., sec 102(b)

8 id., sec 204(b)

9 id., sec 204(c)

10 Exec. Order No. 10,783, 3 C.F.R. 422 (1954–1958).

11 Gabrynowicz, supra., at 408

12 Aeronautics and Space Report of the President, Fiscal Year 2014 Activities (located at http://history.nasa.gov/presrep2014.pdf)

13 Military/National Security Space Activities, Space Policy Online (located at http://www.spacepolicyonline.com/military/index.htm)

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17 United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (“UNOST”), Article I (located at http://www.unoosa.org/pdf/gares/ARES_21_2222E.pdf)

18 Id., Article II.

19 Id., Article III.

20 Id., Article IV.

21 Id.

22 Id., Article V.

23 Id., Article VI.

24 Id., Article VII.

25 Id., Article VIII.

26 Id.

27 Id. Article IX.

28 Id.

29 Id.

30 Id., Article X.

31 Id., Article XI.

32 See UNOOSA website at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html.

33 See UNOOSA website at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html.

34 Convention on International Liability for Damage Caused by Space Objects (the “UN Liability Convention”), Article II (located at http://www.unoosa.org/pdf/gares/ARES_26_2777E.pdf).

35 Id., Article III.

36 Id., Article IV.

37 Id., Article V.

38 Id., Article XXII.

39 Id., Article VI.

40 Id., Article VII.

41 Id., Articles VIII and IX.

42 Id., Article XI.

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45 Id., Article I(b).

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49 Id., Article IV (3).

50 Id., Article VI.

51 See UNOOSA website at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html.

52 See Status of International Agreements relating to activities in outer space as at 1 January 2015, UN Committee on the Peaceful Uses of Outer Space (located at http://www.unoosa.org/pdf/limited/c2/AC105_C2_2015_CRP08E.pdf). This document shows that the UN Moon Agreement has been ratified by Australia, Austria, Belgium, Chile, Khazakstan, Kuwait, Lebanon, Mexico, Morocco, Netherlands, Pakistan, Peru, Philippines, Romania, Saudi Arabia, Turkey, and Uruguay. Additionally, France, Guatemala, and India have signed but not ratified the agreement.

53 UN Moon Agreement, Article 1.

54 Id., Article 3.

55 Id., Article 6.

56 Id., Article 8.

57 Id.

58 Id., Article 6(2).

59 Id., Article 7.

60 Id., Article 9.

61 Id., Article 10.

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63 Id., Article 11(5).

64 Id., Article 11(7).

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66 Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984).

67 Land Remote-Sensing Commercialization Act of 1984, Pub. L. No. 98-365, 98 Stat. 451.

68 See Gabrynowicz, supra., for a discussion of the development of U.S. national space law.

69 See, e.g., 51 U.S. Code chapters 201 and 203.

70 See, e.g., 51 U.S. Code chapters 401-409.

71 See, e.g., 51 U.S. Code chapters 501-511.

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74 National Aeronautics and Space Administration Authorization Act of 2010, Public Law 111-267 – Oct. 11, 2010, 124 Stat. 2805.

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76 Id.

77 See State Support for Commercial Space Activities, FAA, above.

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