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Space Law in the 21st Century: Some Thoughts in Response to the Bush Administration's Space Initiative

Glenn Harlan Reynolds

SPACE LAW IN THE 21st CENTURY: SOME THOUGHTS IN RESPONSE TO THE BUSH ADMINISTRATION'S SPACE INITIATIVE

GLENN HARLAN REYNOLDS*

PRESIDENT BUSH has announced plans for an ambitious new space program that will send human beings to Mars. Coupled with recent evidence suggesting that Mars may have had and may still have water, this has led some experts to proclaim the beginning of a new era:

> Historians will look back on early 2004 as a momentous period in the life of our universe. The landing of two exploratory vehicles on Mars [that recently yielded evidence that planet once was awash with potentially life-supporting water] and President George W. Bush's speech at NASA headquarters earlier this year indicate the world has embarked on a new age of exploration.
> Sending astronauts to the moon is no longer a sufficient goal, as it was for an earlier generation. The president has clearly indicated NASA's new mission will transform the moon into a base for the "next steps of space exploration: human missions to Mars and worlds beyond . . . ."
> Space exploration is now part of an expansive vision of foreign policy that involves applying American power on a broad geographical canvas from the Middle East to outer space.
> Just as we have increased the role of our military forces in various corners of the Earth during the last three years, we will now "extend a human presence across our solar system."
> The president's plans include developing new spacecraft, establishing launching points outside the Earth's atmosphere, and harnessing extraterrestrial resources that will "boggle the imagination" and "test our limits to dream."
> Mr. Bush's program will create a new American empire in space that will resemble the ocean-born empires of the European states in the 17th and 18th centuries. The United States will stake claim

* Beauchamp Brogan Distinguished Professor of Law, University of Tennessee; J.D. Yale Law School, 1985. Prof. Reynolds is coauthor, with Robert P. Merges, of OUTER SPACE: PROBLEMS OF LAW AND POLICY (1989).

to new "open" territories, leverage their resources, and settle them on a small scale.[1]

Such a program, if it bears fruit, will certainly represent a dramatic new initiative in space, and is likely to produce substantial changes in both international law and domestic American law as a result. This short essay will not suffice to analyze those changes in any detail, but I do hope to note some of the most important issues, and to suggest some fruitful areas for future inquiry. These include property rights, space environmental issues, and the role of space tourism.

I. SETTING THE STAGE

The current regime of international space law is moribund. Although space law progressed rapidly during the dynamic 1960s, the apogee of space law's development was the 1967 Outer Space Treaty. Following that Treaty's adoption into force, only relatively minor agreements (like the Liability Convention and the Rescue and Return Treaty, both of which serve to implement commitments already set out in the Outer Space Treaty), or unsuccessful agreements (like the 1979 Moon Treaty, which never found favor with the space powers) have been reached.

The Outer Space Treaty is, in a sense, to blame. At the time it was drafted, the United States and the Soviet Union were in a "space race" to reach the Moon. It was widely feared that whichever superpower reached the Moon first would claim the satellite for itself, and seek to exclude the other. Many were afraid, with some justification, that struggles over possession of the Moon would lead to military conflict in space, and perhaps, eventually, to nuclear war on Earth.

The Outer Space Treaty addressed these fears by barring such claims. Article II of the Treaty provides, "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[2]

Both the United States and the Soviet Union, it appears, were more fearful of their adversary's success than optimistic about their own. As a result, both nations were happy to enter into an

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[1] Jeremi Suri, *New Age of Exploration*, WASH. TIMES, March 5, 2004, at A17.

[2] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, art. II (18), U.S.T. 2410 [hereinafter Outer Space Treaty].

agreement that shut down the competition. The above provision of the Outer Space Treaty–in many ways the Treaty's most important provision–was thus a sort of Cold War collusion in which both nations agreed to throw the race, or at any rate, to forfeit the prize. While the United States continued on to the Moon, the Soviet Union gave up. The United States' behavior in continuing was almost entirely the result of momentum and general public support; the United States government no longer had any great strategic interest in the Moon.

Though the Cold War is now more than ten years in the past, Article II remains. It is thus reasonable to question whether this Cold War artifact, now going on forty years old, has continued vitality.

I don't know the answer to that question. It's possible, I suppose, that a new space race could ignite a new risk of nuclear war–say between the United States and the People's Republic of China–though that seems unlikely to me. On the other hand, it's certainly the case that the end of the space race drastically removed any strategic incentive for space development and space settlement, which is a rather significant cost. It is clear, though, that there is a conflict between the original purpose of Article II, which has vanished, and the goal of promoting human settlement in outer space.

That might be a problem for the Bush administration, but it's worth noting that the human settlement of outer space has officially been United States policy since the 1988 passage of the Space Settlements Act.[3] Fortunately, national sovereignty is not absolutely essential to the human settlement of outer space. Since the Outer Space Treaty forbids only "national appropriation" and not private property rights, most scholars and experts believe that there is no legal bar to private property rights in outer space.[4]

In fact, a number of proposals for a "deed registry" or other mechanisms for recognizing space property rights have been made. There seems little doubt that the United States govern-

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[3] Pub. L. No. I-100-684, Title II, § 217; 102 Stat. 4094 (codified at 42 U.S.C.A. § 2451 (West 2003)). This Act explicitly endorsed the "extension of life beyond Earth's atmosphere, leading ultimately to the establishment of space settlements," and provided for biannual reports by NASA regarding its efforts to promote this goal. *Id.*

[4] *See generally* Glenn H. Reynolds & Robert P. Merges, *Space Resources, Common Property, and the Collective Action Problem*, 6 N.Y.U. ENV. TL. J. 107 (1997) (describing property rights issues relating to space development).

ment, if it chose to do so, could decide to recognize property rights in areas for which there is no claim of sovereignty. In fact there is precedent for such an approach.

In 1980, the United States Congress passed the Deep Seabed Hard Mineral Resources Act (the Act), which established a mechanism for recognizing mining claims by United States ventures regarding deep seabed mineral deposits outside the territorial jurisdiction of any nation.[5]

The Act specifically provides:

> It is the legal opinion of the United States that exploration for and commercial recovery of hard mineral resources of the deep seabed are freedoms of the high seas subject to a duty of reasonable regard to the interests of other states in their exercise of those and other freedoms recognized by general principles of international law.[6]

The Act also provides that it is not to be considered an extension of sovereignty over international common areas, but rather a mechanism for recognizing the rights of United States nationals in those areas. Section 3(a) of the Act states:

> (a) Disclaimer of Extraterritorial Sovereignty,—By the enactment of this Act, the United States—,
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> (1) exercises its jurisdiction over United States citizens and vessels, and foreign persons and vessels otherwise subject to its jurisdiction, in the exercise of the high seas freedom to engage in exploration for, and commercial recovery of, hard mineral resources of the deep seabed in accordance with generally accepted principles of international law recognized by the United States; but
>
> (2) does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any areas or resources in the deep seabed.[7]

Though this particular issue has been mooted by the United States' eventual accession to the Law of the Sea Treaty, the approach illustrates that, if it chooses, the United States government may recognize private property claims in international common areas. Such an approach might lead to the United States being characterized as "unilateralist." Given the preva-

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[5] Deep Seabed Hard Mineral Resources Act, Pub. L. No. 96-283, 94 Stat. 553 (1980).

[6] *Id.* § 2(a)(12).

[7] *Id.* § 3(a).

lence of such characterizations by other countries, an American administration might nevertheless be undeterred.

Needless to say, a generally agreed upon international framework for establishing space property rights would be preferable to a unilateral American approach. Quite a few scholars have formulated opinions as to what such a framework should look like,[8] but the real question is how to get there, given the current dysfunctional character of multilateral diplomacy. It may be that the pressure created by unilateralism, or the threat thereof, will play a necessary role in kickstarting multilateral discussions.

II. ENVIRONMENTAL ISSUES

Outer space is huge, and thoughts of "protecting the space environment" may seem absurd. Though space is huge, parts of it–such as the orbital paths near Earth–are not, and are in danger of becoming unusably polluted if attention is not paid.[9] Scholars have looked at this issue as well. Robert Merges and I suggested in 1989[10] that unidentified orbital debris–the most common kind of debris–might be dealt with via a market-share liability scheme along the lines of that formulated in the famous *Sindell* case.[11] This approach has found considerable favor in the literature,[12] though it has not yet been adopted in any international agreement.

The much more aggressive space program envisioned by President Bush, however, raises very different questions. Long-term human presence on other planets, and satellites such as the Moon and Mars, raises different kinds of environmental issues.

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[8] *See, e.g.*, Reynolds & Merges, *supra* note 4, at 117-18 (proposing a "deed registry" recognizing first-mover claimants); Lynn M. Fountain, *Creating Momentum in Space: Ending the Paralysis Produced by the "Common Heritage of Mankind" Doctrine*, 35 CONN. L. REV. 1753 (2003) (surveying scholarship on this subject); Kevin V. Cook, *The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty*, 11 GEO. INT'L ENVTL. L. REV. 647 (1999) (presenting pro-development proposals based on other international space and resource agreements).

[9] On this subject generally, see David Tan, *Towards a New Regime for the Protection of Outer Space as the "Province of All Mankind"*, 25 YALE J. INT'L L. 145 (2000).

[10] Reynolds & Merges, *supra* note 4, at 176-77.

[11] *See, e.g.*, Sindell v. Abbott Lab., 607 P.2d 924, 937 (Cal. 1980), *cert. denied*, 449 U.S. 912 (1980) (defendant's liability based on market share in offending product).

[12] *See* Mark J. Sundahl, *Unidentified Orbital Debris: The Case for a Market-Share Liability Regime*, 24 HASTINGS INT'L & COMP. L. REV. 125 (2000) ("The application of this theory of liability to the unidentified debris problem was first proposed in 1989 by Professors Glenn Reynolds and Robert Merges. Recently, this idea has enjoyed a resurgence in space debris scholarship.").

Some questions are less refined, but still important. The 1967 Outer Space Treaty requires its signatories to conduct explorations of celestial bodies "so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter."[13] When you get to Mars you may create the first, and if there's life on Mars, you may create the second—assuming that you plan to return to Earth.

That human explorers will "contaminate" Mars is inevitable—humans contain oceans of bacteria, and a human presence on Mars is sure to leave some behind. Even if all wastes are bagged and returned to Earth (unlikely because of the expense involved), some germs are bound to escape via air leaks, transport on the exterior surfaces of astronaut landing suits and other objects that exit the spacecraft, etc.

NASA now takes extensive steps to sterilize unmanned spacecraft[14] so as to keep Earth germs from reaching other planets, something known in the trade as "forward contamination." Such precautions may be adequate for robotic missions, but it is simply impossible to ensure that missions involving people won't result in contamination. They will.

If Mars has life of its own (unlikely, but not impossible) the situation gets harder. First, we may have to consider whether Martian bacteria or lichens or the like may be harmed by whatever organisms humans bring. Then we have to decide whether we care about that. Is harm to bacteria the sort of harm the Outer Space Treaty was meant to prevent? Almost certainly not, but no doubt bacteria-rights advocates will do their best to get a debate fermenting here on Earth.

Martian bacteria raise another question: the question of "back contamination," as it's called—contamination of the Earth by Martian organisms. That, too, will be difficult to rule out in the event of a manned mission. Oh, it's unlikely that bacteria that can survive in the Martian environment will flourish on Earth, and even less likely that Martian bacteria would prove harmful to Earth life. But unlikely isn't the same as impossible, and people are likely to worry. In fact, people already have worried about it in the context of robotic sample-return missions.

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[13] Outer Space Treaty, *supra* note 2 art. IX 18 U.S.T. 2410.

[14] *See* Jet Propulsion Laboratory, *Planetary Protection for Solar System Exploration*, *at* http://planpro.jpl.nasa.gov/fctshtss.htm (visited March 10, 2004) (describing sterilization procedures).

Human missions, however, pose far more worrisome questions. Human beings on Mars are certain to come into contact with Martian dust, atmosphere, and other material. If there are Martian bacteria, humans are very likely to be contaminated with them. Moreover, the decontamination of human beings is, as a practical matter, impossible. This problem was faced in the Apollo area, and was dealt with by quarantining astronauts in the so-called Lunar Receiving Laboratory until scientists were convinced that there was no danger.[15]

It is possible, of course, that such worries are overstated. There is considerable evidence that large amounts of Martian material have already reached Earth as the result of meteoric impacts:

> So far, 6 [M]artian meteorites have been identified among the 8,000 meteorites recovered from Antarctica. However, considerable analysis is required to identify [M]artian origin, and most of these meteorites have undergone only cursory examination. If we accept the 1:100 ratio as being representative, then of the roughly 500 meteorites that fall on Earth every year, perhaps 5 are from Mars. . . ."
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> However, theoretical modeling suggests that about 1 percent of any material ejected from Mars should be captured by Earth within 16,000 years and that 0.01 percent would reach Earth within 100 years. Thus, survival of organisms in a meteorite, where largely protected from radiation, appears plausible. If microorganisms could be shown to survive conditions of ejection and subsequent entry and impact, there would be little reason to doubt that natural interplanetary transfer of biota is possible.[16]

Terrestrial material is also believed to have been transported to Mars in the same fashion, though of course there are no "smoking gun" meteorites available as proof yet.[17]

Beyond these planetary-hygiene concerns are questions of *deliberate* changes to the Martian environment. Many writers have already advocated the "terraforming" of Mars, to give it an Earthlike, or at least a *more* Earthlike climate. Such efforts appear

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[15] *See* McClane, *et al., Lunar Receiving Laboratory*, 155 SCI. 525 (1967) (describing Lunar Receiving Laboratory and plans leading to it); Darlene Cypser, *International Law and Policy of Extraterrestrial Planetary Protection*, 33 JURIMETRICS. 315 (1993).

[16] National Research Council, Task Group on Issues in Sample Return, *Mars Sample Return: Issues and Recommendations: The Significance of Martian Meteorites, available at* http://planpro.jpl.nasa.gov/mrsrch3.html (last visited March 10, 2004) (cittions ommitted).

[17] *Id.*

to be feasible using technology that can be extrapolated from present capabilities.[18] In short, the very "greenhouse effect" that some fear may be warming Earth could likely be put to use to warm Mars, thus producing an environment in which humans could live with reasonable comfort. As Bob Zubrin writes:

> If CF4 were produced and released on Mars at the same rate as chlorofluorocarbon (CFC) gases are currently being produced on Earth (about 1000 tonnes per hour), the average global temperature of the Red Planet would be increased by 10 degrees C within a few decades. This temperature rise would cause vast amounts of carbon dioxide to outgas from the regolith, which would warm the planet further, since CO2 is a greenhouse gas. The water vapor content of the atmosphere would vastly increase as a result, which would warm the planet still more. These effects could then be further amplified by releasing methanogenic and ammonia-creating bacteria into the now-livable environment, as methane and ammonia are very strong greenhouse gases. The net result of such a program could be the creation of a Mars with acceptable atmospheric pressure and temperature, and liquid water on its surface within fifty years of the start of the program.[19]

If the above were true, Mars wouldn't have a breathable atmosphere, but would support crops and allow people to move around without spacesuits. This raises environmental questions of its own. The Outer Space Treaty doesn't forbid "contamination." It prohibits *harmful* contamination. What does that mean? Well, if Mars is lifeless, harmful contamination can only be contamination that interferes with human purposes. At the moment, to scientists, any contamination seems harmful, since it may make it harder for them to determine if Mars has native life when any discovered life might have actually come from Earth ("Hey, look, Mars has E. Coli! Er, or some space-probe-manufacturing guy on Earth has poor personal hygiene.") But isn't terraforming different? It will make Mars better, and open to far more extensive human uses; uses that go beyond scientific investigation.

Naturally, this will make some people unhappy. Though terraforming would not, in my opinion, violate the Outer Space Treaty – which prohibits only "harmful," not beneficial, contam-

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[18] A good survey of this subject can be found in MARTYN J. FOGG, TERRAFORMING: ENGINEERING PLANETARY ENVIRONMENTS (1995).

[19] ROBERT ZUBRIN, ENTERING SPACE: CREATING A SPACEFARING CIVILIZATION 37 (1999).

ination – there are sure to be vigorous objections raised from certain quarters of the environmental movement. Indeed, such objections have already appeared in a few scattered locations. The character of these objections is likely to reveal much about the environmental movement, or at least about those making them.

Objections to terraforming can be roughly categorized as follows: (1) the "Peter Sellers" objection ("now is not the time"); (2) the scientific objection; (3) the theological objection; and (4) the human-cancer objection.

The Peter Sellers objection is that terraforming efforts should not begin until we have extensive knowledge of the Martian geology and climate. Efforts that are begun too soon may not work as anticipated, and might conceivably interfere with better thought-out efforts later.

It is hard to argue with this objection. Though experts may disagree as to when we know enough, and, undoubtedly, people opposed to terraforming on other grounds may for political reasons raise this objection rather than reveal their true motives, the basic principle is sound. Martian terraforming efforts should not go off half-cocked. The good news is that the need for a solid database on Martian climate and geology makes today's unmanned missions–which space settlement enthusiasts view as unexciting–quite valuable. We're simply not in a position to begin terraforming efforts on Mars now, but by advancing our knowledge of such important factors, we nonetheless hasten the day when it will take place. Think of the robotic probes visiting Mars as the latter-day equivalents of Lewis and Clark or Zebulon Pike.

The scientific objection may be viewed as a near-cousin of the Sellers objection. Once terraforming efforts begin in earnest, information about the primeval Mars will be lost. Scientists can thus be expected to protest that terraforming should not begin until all interesting data about Mars in its current state have been extracted. Unfortunately, that is a task that will never be entirely completed. Meaning, we will have to weigh the value of additional scientific data (which is likely to be significant) against the value of an entire new world for settlement, which is likely to be colossal.

The theological objection involves no such tradeoffs, but rather an assertion that human beings simply *are not meant* to settle other planets – a variation on the old "if man were meant to fly he'd have wings" argument from the 19th Century. Vari-

ants of this argument, in keeping with strands of thought among today's quasi-religious Deep Ecology adherents, might say that the "pristine" character of an "unspoiled" Mars is of such enormous, even "sacred" value, that no development–or perhaps even human exploration–should be permitted.

As the use of words like "unspoiled" and "pristine" suggest, this is fundamentally an aesthetic view masquerading as a religious one (and, indeed, the world's major religions offer precious little support to such a view). One might plausibly prefer an empty, dead Mars over a living, vibrant one; just as one might plausibly prefer the Backstreet Boys to the Beatles. Since such views are founded in taste, and *de gustibus non disputandum est,* such views do not lend themselves well to rational debate, nor are they likely to prove persuasive to those who do not already hold the predisposition to share them.

The human-cancer objection is essentially a stronger version of the theological objection: humanity is so awful, such a blight on the face of the Earth, that the last thing we should want to see are people spreading everywhere else, carrying their nastiness with them and polluting everything they contact.

These considerations have been looked at in far more detail by a former student of mine, Robert Pinson, in an article entitled *Ethical Considerations for Terraforming Mars,* recently published in the *Environmental Law Reporter.*[20] Pinson concludes that environmental ethics probably support terraforming Mars, even if Mars possesses life. Of course, not every analyst will agree.

Regardless, however, the Outer Space Treaty and other existing space law does not really answer the questions. By prohibiting "harmful" contamination, the Outer Space Treaty appears, by implication, to allow contamination that is not harmful–such as the seeding of Mars with beneficial bacteria. But since the Treaty provides little guidance on what kind of contamination is or is not harmful, the issue is likely to be a contentious one. Fortunately (for scholars, at least) there is plenty of time to address this issue before it becomes concrete.

III. SPACE TOURISM

Unlike Martian terraforming, space tourism is already a going concern, as the space flights of paying space tourists like Dennis Tito demonstrate. It is also an area of considerable promise, as

[20] Robert Pinson, *Ethical Considerations for Terraforming Mars,* 32 ENV. L. REP. 11333 (2002).

space enthusiasts believe that paying passengers will promote the development of lower-cost spaceflight technologies in a way that government-funded programs are unlikely to. Recent legislation (passed in the House of Representatives as this essay was being written), would promote space tourism by clarifying the regulatory process and by protecting spaceflight operators from tort claims by passengers, as it requires informed consent and the execution of reciprocal waivers.[21] This seems to indicate a much greater degree of congressional interest than has been seen in recent years. Representative Sherwood Boehlert (R-N.Y.), chairman of the House Science Committee, said that while he first thought the legislation was "a little flighty," he came to realize that "this is about a lot more than joyrides in space. This is about the future of the U.S. aerospace industry."[22]

Space tourism is not, of course, directly related to the Administration's Moon-Mars initiative, but support for space tourism is part of the Administration's overall strategy to maximize private sector involvement in spaceflight, as a way of encouraging reduced costs and improved technology. Though it will be some years before space tourism is anything but a rich person's toy–just as it took aviation many decades to attain the mainstream status it enjoys today–we're likely to see many more private individuals flying into space, as tourists or as commercial employees, in this century than we saw in the last. Under the Outer Space Treaty, all of these individuals will be treated as "envoys of mankind," a status that may, perhaps, come to seem a bit exalted as space activity becomes more routine.

This raises a number of issues, such as "avenues of redress (or lack thereof) when a U.S. citizen is the victim of a tort committed by a sovereign state in outer space."[23] And where United States federal employees are involved, there are also issues growing out of the Federal Tort Claims Act.[24]

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[21] Commercial Space Launch Act Amendments of 2004, H.R. 3752 108th Cong. (2004). On reciprocal waivers and their limits, see Kim B. Watson, *Have the Courts Grounded the Space Launch Industry? Reciprocal Waivers and the Commercial Space Launch Act*, 39 JURIMETRICS J. 4545 (1998).

[22] Associated Press, *House bill sets rules for space tourism*, Mar. 4, 2004, *available at* http://www.msnbc.msn.com/id/4449577 (last visited Mar. 11, 2004).

[23] James A. Beckman, *Citizens Without a Forum: The Lack of an Appropriate and Consistent Remedy for United States Citizens Injured or Killed as the Result of Activity Above the Territorial Air Space*, 22 B.C. INT'L & COMP. L. REV. 249 (1999).

[24] *See* Lauren S.B. Bornemann, *This is Ground Control to Major Tom . . . Your Wife Would Like to Sue but There's Nothing We Can Do . . . The Unlikelihood That the FTCA*

Legislative responses to these problems are easy to imagine, and it is likely that we'll see more Congressional action to update United States space law. On the international law front, the picture is less promising. But both domestic law, and international law, depend in no small part on thoughts from scholars and practitioners, and there has been a lot of interesting work (much done by student writers) in the field of space law scholarship. It is my hope that we will see these issues, and others, receive more attention in coming years.

Waives Sovereign Immunity for Torts Committed by United States Employees in Outer Space: A Call for Preemptive Legislation, 63 J. AIR L. & COM. 517 (1998).

Comments


SOUTHERN METHODIST UNIVERSITY
DALLAS, TEXAS