

One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues

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[L]aws and institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths discovered and manners and opinions change, with the change of circumstances, institutions must advance also to keep pace with the times.

—Thomas Jefferson¹

INTRODUCTION

A hallmark of United States national space law is that it tends to follow the development of space technology and geopolitical events. Technology that develops into applications tends to catalyze law that addresses the commercialization of the technology. After the successful launch of *Sputnik I* on October 4, 1957, the United States addressed the legal void that then existed for space activities by promulgating its own national law and encouraging the global community to establish space law at the international level.² This resulted in the 1958 National Aeronautics and Space Act at the national level and in a treaty regime at the international level including, among others, the Outer Space Treaty. Since then, U.S. national space law has continued to develop, catalyzed in large part by technological and geopolitical advances. The historical significance of the early origins of U.S. space law is quite remarkable when one considers that even nations that have been major space

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† This Article addresses U.S. civil and commercial space law and only addresses military and national security space law when it is relevant to the discussion of civil or commercial law. National security law is a large and complex body of law that goes well beyond the scope of this Article. For an excellent review of U.S. national security space law see R. Cargill Hall, *The Evolution of U.S. National Security Space Policy and Its Legal Foundations in the 20th Century*, 33 J. SPACE L. 1 (2007).

¹ Letter from Thomas Jefferson to Samuel Kercheval (July 12, 1816), in 10 THE WRITINGS OF THOMAS JEFFERSON: 1816–1826, at 42–43 (Paul Leicester Ford ed., 1899).

² See WALTER A. MCDUGALL, . . . THE HEAVENS AND THE EARTH: A POLITICAL HISTORY OF THE SPACE AGE 6–8 (The Johns Hopkins Univ. Press 1997) (1985).

farers for decades, like France and Japan, did not pass national space laws until 2008.³

This Article traces the evolution of U.S. space law from its inception in 1958 to the present and briefly presents some issues emerging for future consideration. It is divided into three main sections. Part I addresses the evolution of U.S. national space law from the 1950s and 1960s to the present and is divided into chronological subsections. The first subsection addresses the 1950s and the first goals of U.S. space law: to meet Cold War exigencies and to develop a legal and physical space infrastructure. The second subsection examines legislation of the 1980s, which introduced commerce as the third sector of space law alongside the civil and military sectors. The third subsection considers how the law developed in the 1980s and 1990s to meet the issues raised by the maturation and application of launch and remote sensing technologies. Regulatory refinement promulgated in the 2000s is the subject of the fourth subsection.

Part II contains a brief discussion of the 2009 codification of space law in the United States Code. Part III then identifies and briefly explores three emerging space law issues that have the potential to affect national space activities in the long term: space law unfolding at the individual state level, licensing of commercial orbital flights, and an evolving definition of the term “commercial.”

I. 1958–2008

A. *1958 and 1962: Institutional and Legal Space Infrastructure*

1. *The 1958 National Aeronautics and Space Act*

Early space activities were catalyzed by geopolitical events. They were not identified as a stand-alone policy goal. It was the successful launch of *Sputnik I* that sent the United States on a search for a dramatic and effective demonstration to prove that U.S. technology was superior to the Soviet Union's. *Sputnik I*, the world's first artificial satellite, shocked the world. *Sputnik*, (Russian for “traveling companion”) was the size of a basketball and weighed 183 pounds.⁴ The fear caused by *Sputnik I* may be hard to understand in today's internet era. But for the World War II-weary world, it represented the potential for atom bombs to rain down unexpectedly from space anywhere on Earth. For the United States, it also represented the first credible potential attack on national territory since the War of 1812. This threat prompted the U.S. Congress to create a legal and institutional infra-

³ See Law No. 2008-518 of June 3, 2008, 34 J. SPACE L. 435 (2008); Setsuko Aoki, *Current Status and Recent Developments in Japan's National Space Law and Its Relevance to Pacific Rim Space Law and Activities*, 35 J. SPACE L. 362, 365 (2009).

⁴ DEBORAH D. STINE, CONG. RESEARCH SERV., U.S. CIVILIAN SPACE POLICY PRIORITIES: REFLECTIONS 50 YEARS AFTER SPUTNIK (2009), available at <http://www.fas.org/sgp/crs/space/RL34263.pdf>.

structure that would enable the United States to respond to *Sputnik*. As a result, it passed, and President Eisenhower signed, the National Aeronautics and Space Act of 1958 (NAS Act).⁵

The new law established the means to respond to the threat *Sputnik* represented: the U.S. civil space program. It also established the institution responsible for executing the response, the National Aeronautics and Space Administration (NASA). NASA began developing a program for human space exploration on October 1, 1958, almost exactly one year after *Sputnik I* was launched.⁶ Three years later, in 1961, the Kennedy Administration gave NASA its first mission: to land, within a decade, a human on the Moon and return him safely. Since then, both the nation's space activities and the law that authorizes them have continued to evolve as required by politics and technology.

Over the years, the NAS Act has become an amalgam of many bodies of law including contract, tort, international, insurance and indemnification, and intellectual property, among others. It also addresses a wide variety of subjects ranging from the philosophical and scientific (such as determining the extent of life in the universe⁷) to space-specific activities (like the *International Space Station*⁸) to the terrestrially pragmatic (like appropriations⁹). More recently, the mechanisms of the Act have expanded to include innovations like awards and competitive prizes to stimulate research and development.¹⁰

However, in the beginning a number of basic, major decisions had to be made. Two of the most important issues were the purpose of the newly established space program and the appropriate relationship between the civil and military programs. Regarding the first decision, the purpose described in the NAS Act tracks the diplomatic strategy taken by the United States in the United Nations to develop new law to prevent the U.S.-U.S.S.R. rivalry from extending into space.¹¹ Therefore Congress declared 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."¹²

This language has both precedential and strategic significance. The legal term of art "peaceful purposes" emerged almost simultaneously in the NAS Act and in the historic UN General Assembly resolutions relating to outer space that became the foundation for the eventual space law treaty regime.¹³ Regarding strategy, when *Sputnik I* orbited the Earth, policymak-

⁵ National Aeronautics and Space Act of 1958, Pub. L. No. 85-568, 72 Stat. 426 (codified as amended at 42 U.S.C. §§ 2451-84 (2006)).

⁶ STINE, *supra* note 4, at 4.

⁷ See 42 U.S.C. § 2451.

⁸ See *id.*

⁹ See *id.* § 2459f.

¹⁰ See *id.* § 2459f-1.

¹¹ McDougall, *supra* note 2, at 173-74, 179.

¹² 42 U.S.C. § 2451(a).

¹³ *E.g.*, Question of the Peaceful Use of Outer Space, G.A. Res. 1348 (XIII), at 5-6 (Dec. 13, 1958).

ers and lawmakers believed space could only be used for war making. According to Eilene Galloway, the congressional researcher recruited by then-Senator Lyndon B. Johnson to help create U.S. space law,¹⁴ it was only when scientists told lawmakers that space could also be used for “purposes other than war: communications, weather, medicine” and “instead of fear of war, we could be motivated by the hope for peace”¹⁵ that space law was able to move space activities in an entirely new direction. Lawmakers codified this delicate balance between fear and hope when they declared that space activities *should be* devoted to peaceful purposes rather than declaring that they *shall be*. Without knowing the full extent of the Soviet Union’s space capabilities, Congress gave itself room to address the unknown as it unfolded by advocating rather than requiring “peaceful purposes.”

Congress addressed the second basic question, the appropriate relationship between the civil and military space programs, when it declared:

Aeronautical and space activities . . . shall be the responsibility of, and shall be directed by, a civilian agency . . . except activities peculiar to or primarily associated with development of weapons systems, military operations, or the defense of the United States . . . shall be the responsibility of, and shall be directed by, the Department of Defense.¹⁶

The characteristics of this relationship were strongly influenced by the former Supreme Allied Commander, President Dwight D. Eisenhower. He was determined that the U.S. space program should be the opposite of the overtly militaristic Soviet program and that it would not create a national deficit.¹⁷ Therefore, Eisenhower resisted popular sentiment and military pressure and endeavored to place the national space program under civil control. By executive order, Eisenhower transferred all space-related civilian personnel, property, and funds not primarily related to military operations and weapon system development from the Department of Defense (DoD) to NASA.¹⁸

The civil-military relationship has ebbed and flowed over the years, with the relative closeness of purpose waxing and waning as political forces

¹⁴ 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. Eilene M. Galloway was the Founding Mother of U.S. national space law and a cofounder of international space law. There is simply no room here to even begin to discuss her contribution to space law and preventing nuclear weapons in space. The reader is strongly urged to learn more about Mrs. Galloway and her contribution. See NASA, The Woman Who Helped Create NASA, http://www.nasa.gov/topics/history/galloway_space_act.html (July 28, 2008) (on file with the Harvard Law School Library).

¹⁵ Video: Happy 100th to the Woman Who Helped Create NASA, http://www.nasa.gov/mission/earth/everydaylife/galloway_100.html (last visited May 14, 2010).

¹⁶ 42 U.S.C. § 2451(b).

¹⁷ ROGER HANDBERG, SEEKING NEW WORLD VISTAS: THE MILITARIZATION OF SPACE 44–57 (2000).

¹⁸ Exec. Order No. 10,783, 3 C.F.R. 422 (1954–1958).

changed. It continues to be a source of tension for both NASA and DoD.¹⁹ Nonetheless, NASA remains a civil agency committed to civil missions.

2. *The 1962 Commercial Communications Satellite Act*

The Communications Satellite Act of 1962 (Comsat Act)²⁰ began as a Cold War tool and contained a strategy that became the legal foundation for the United States' and the world's most lucrative space-based industry: telecommunications. The Act embodied both Cold War political and humanitarian motives. It was intended to influence what President John F. Kennedy called "emerging democracies" by providing for services for less economically developed countries.

The Comsat Act authorized U.S. participation in the development and operation of Intelsat, an international communications satellite organization and system.²¹ Intelsat members agreed to make effective and equitable use of space communications satellites. Under this agreement the electromagnetic spectrum was considered to be a scarce resource that should be made available to all nations on a global and nondiscriminatory basis. Intelsat would provide a legal, administrative, and technological system under which participating countries could access portions of the spectrum for use within their nations. As a condition of membership, member nations agreed not to compete with Intelsat, making it a legal global monopoly.

Satellite communications quickly became an enormous commercial success, and technology enabled more efficient use of both the electromagnetic spectrum and the slots in geosynchronous orbit where the communications satellites are placed. In the 1990s, political pressure to break up national and international communications monopolies and to increase the role of the private sector led to the substantial restructuring of Intelsat from 2000 to 2005.²² Controversy currently exists over whether this new form is a viable and equitable one.²³ Satellite communications have spawned a dynamic and complex body of law at the national and international level, a discussion of which is beyond the scope of this Article. Suffice it to say, like all other U.S. space-based activities and law, it began in the Cold War and has transformed to meet the needs of the globalization era.

¹⁹ See, e.g., Joanne Irene Gabrynowicz, *The Perils of Landsat from Grassroots to Globalization: A Comprehensive Review of US Remote Sensing Law With a Few Thoughts for the Future*, 6 CHI. J. INT'L L. 45, 65–66 (2005).

²⁰ Communications Satellite Act of 1962, Pub. L. No. 87-624, 76 Stat. 419 (codified as amended at 47 U.S.C. §§ 701–69 (Supp. II 2008)).

²¹ See Communications Satellite Act of 1962 § 102(a), 76 Stat. at 419.

²² See Open-market Reorganization for the Betterment of International Telecommunications Act (Orbit Act), Pub. L. No. 106-108, 114 Stat. 48 (2000) (codified at 47 U.S.C. §§ 761–69).

²³ See generally Kenneth Katkin, *Communication Breakdown?: The Future of Global Connectivity After the Privatization of INTELSAT*, 38 VAND. J. TRANSNAT'L L. 1323 (2005).

B. 1980s: Commerce

Once the legislative and executive branches determined the relative roles of NASA and DoD, the civil space program proceeded to make history with the *Mercury*, *Gemini*, and *Apollo* programs. Together, on July 20, 1969, they resulted in the epic landing of the first humans on another celestial body, the Moon. The post-*Apollo* program continued with *Skylab*, the *Apollo-Soyuz* Test Program, and the *Space Shuttle*, which was declared operational in 1982. All of these missions relied on the U.S. private sector to provide the government with goods and services on a contractual basis.

Around this time, the Reagan Administration ushered in an era driven by the conviction that the private sector could conduct many government activities more efficiently and more appropriately than the public sector. Further, the mature technology could now be subjected to market forces, and the private sector could use those forces to make space technology and its products available to public, nongovernmental customers. The Reagan Administration began to seek proposals for transferring various space assets and activities out of the government and into the private sector.²⁴ These proposals led to laws that were passed on the premise that launch and remote sensing technologies had matured to a point where government participation was no longer, or nearly no longer, needed.

Congress, in an attempt to gain control of a process begun by the executive branch, also began to seek opportunities to commercialize or privatize space activities. In 1984, Congress amended the Declaration of Policy and Purpose section of the NAS Act to state: "Congress declares that the general welfare of the United States requires that [NASA] . . . seek and encourage, to the maximum extent possible, the fullest commercial use of space."²⁵ Thus, commercial space joined civil and military space to become the third legally recognized sector of U.S. space activities.

In addition to this expanded statement of policy and purpose, the same Congress, through the same committees, also passed the 1984 Commercial Space Launch Act (Launch Act)²⁶ and the Land Remote-Sensing Commercialization Act of 1984 (Commercialization Act).²⁷ It was not long, however, before both laws were amended to reflect changes driven by intertwined politics, economics, and technology.

²⁴ See, e.g., Gabrynowicz, *supra* note 19, at 53.

²⁵ National Aeronautics and Space Appropriations Act of 1985, Pub. L. No. 98-361, 98 Stat. 426 (1984) (codified at 42 U.S.C. § 2451(c) (2006)).

²⁶ Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (codified as amended at 49 U.S.C. § 70101 (Supp. II 2008)).

²⁷ Land Remote-Sensing Commercialization Act of 1984, Pub. L. No. 98-365, 98 Stat. 451 (codified at 15 U.S.C. § 4201 (repealed 1992)) (regulating the satellite observation of land masses).

C. *1980s and 1990s: Applications—Launch and Remote Sensing Technology*

1. *Launch Law*

Congress had two main objectives when it passed the Launch Act in 1984: to encourage, facilitate, and promote commercial space launches by the private sector; and to develop licensing requirements through consultation with other government agencies.²⁸ It also made a single federal agency, the Department of Transportation (DoT), responsible for regulating the industry. The Launch Act and subsequent regulations addressed three substantive areas: licensing and regulation, liability insurance requirements, and access to government launch facilities by private launch companies.

Before the passage of the Launch Act, it was U.S. national policy that all civil, military, and commercial payloads would be launched by the *Shuttle*. There were a variety of reasons for this policy, but essentially the Nixon Administration expected the *Shuttle* program to attract the important electoral votes of California, Florida, and Texas—states that are home to large space centers.²⁹ National policymakers intended to make the *Shuttle* an all-purpose space transportation vehicle with a successful record of delivering payloads to orbit. This policy effectively made it illegal to employ single-use rockets, known as expendable launch vehicles (ELVs). So the Launch Act was intended to permit the use of ELVs on a commercial basis. However, the tragic loss of the *Challenger* in 1986 caused the Reagan Administration to reconsider U.S. national launch policy and to prohibit NASA from launching commercial payloads. The new policy later became law in the NASA Authorization Act for U.S. federal fiscal year 1991.³⁰ This law limits the *Shuttle* to activities that require either a human presence or unique capabilities that only the *Shuttle* can provide.

The separation of civil, military, and commercial launches and an increased emphasis on commercialization has resulted in a series of changes in space transportation law since 1986. In these years, launches may have become more common commercial activities, but they still involve immensely expensive technology, high-powered explosives, and range-safety requirements. A launch gone wrong has the potential to cause extremely large amounts of human injury and property damage. Further, all launch facilities in the United States are government built, funded, maintained, and operated. Private sector launches occur from Cape Canaveral in Florida, Vandenberg Air Force Base in California (DoD), and the Kennedy Space Flight Center in Florida (NASA). Therefore, a major feature of recent legislative changes

²⁸ Commercial Space Launch Act § 3, 98 Stat. at 3055–56 (codified at 49 U.S.C. § 70101(b)).

²⁹ R. MICHAEL GORDON, *THE SPACE SHUTTLE PROGRAM: HOW NASA LOST ITS WAY* 19 (2008).

³⁰ National Aeronautics and Space Administration Authorization Act, Fiscal Year 1991, Pub. L. No. 101-611, 104 Stat. 3188 (1990) (codified at 42 U.S.C. § 2464a(a)).

has been the articulation of the relationship between the public and private sectors as it relates to the risks inherent in launch activities.

The fact that the U.S. private sector must rely on government facilities to provide its launch services and products is part of an ongoing trans-Atlantic debate between U.S. companies and their European counterparts. This issue will be discussed in greater detail below, but in short, U.S. aerospace companies continue to cite the commercial activities of foreign governments and their use of industrial policy as reasons for continuing the favorable U.S. government-industry risk-sharing regime contained in U.S. launch law. Since most western industrialized nations, including Canada and Japan, follow a European model for aerospace funding systems and policies, it is reasonable to expect that Congress will extend the U.S. risk-sharing regime each time it is up for review.

In 1988, Congress substantially amended the Launch Act to further define the commercial launch legal regime.³¹ The 1988 Amendments authorized the U.S. government to indemnify commercial space transportation for third-party liability and required the industry to obtain insurance up to a “maximum probable loss” standard for each launch. These and other industry-government risk sharing provisions were in effect through 1993 and were subsequently extended through 2004. The 2004 Commercial Space Launch Amendments Act,³² discussed below, also required that DoT study whether or not the indemnification of commercial expendable launch vehicles ought to be continued. Over the decade, Congress twice extended indemnification for third-party liability, first until 2009, and currently through 2012.³³

In the 1990s, the *Shuttle* became NASA’s most expensive activity and threatened to consume NASA’s budget.³⁴ As a result, *Shuttle* operations were privatized in 1996 with a ten-year Space Program Operations Contract between NASA and United Space Alliance (USA), a limited liability company currently owned equally by the Boeing Company and the Lockheed Martin Space Operations Company.³⁵ NASA and USA entered into a second contract in 2006, which establishes USA as NASA’s primary industry partner in human space operations, including for the *Shuttle* and the *International Space Station (ISS)*.³⁶

The most recent major change in the law occurred in 2004 with the passage of the Commercial Space Launch Amendments Act of 2004.³⁷ This

³¹ Commercial Space Launch Act Amendments of 1988, Pub. L. No. 100-657, 102 Stat. 3900 (codified as amended at 49 U.S.C. § 70112).

³² Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (codified at 49 U.S.C. §§ 70101–21).

³³ An Act to Extend the Commercial Space Transportation Liability Regime, Pub. L. No. 111-125, 123 Stat. 3486 (2009).

³⁴ See generally U.S. GEN. ACCOUNTING OFFICE, GAO/NAIAD-95-118, SPACE SHUTTLE: NASA MUST REDUCE COSTS FURTHER TO OPERATE WITHIN FUTURE PROJECTED FUNDS (1995), available at <http://archive.gao.gov/t2pbat1/154853.pdf>.

³⁵ United Space Alliance, USA History, <http://www.unitedspacealliance.com/about/history.asp> (on file with the Harvard Law School Library).

³⁶ *Id.*

³⁷ 49 U.S.C. §§ 70101–21.

law reflects a belief in a commercial market for “space tourism”: flights into suborbital space for individuals willing to pay \$200,000 or more for one trip. The 2004 law authorizes private and commercial passengers to engage in space travel and establishes the licensing of private sector spacecraft to bring paying passengers on suborbital flights.

2. *Remote Sensing Law*

Remote sensing is the imaging of the Earth and its atmosphere from a distance. The first civil remote sensing satellite, *Landsat 1*, was launched in 1972. Since then, there have been four distinct phases of U.S. remote sensing law.³⁸ In all of these phases, the core issue that has driven the law’s development is the proper institutionalization of a technology that was funded with tax dollars and developed by the government, but which also has clear benefits for both the public and private sectors. For weather satellites, this determination has been clear: they are a public good that shall not be subject to commercialization.³⁹ However, for land-imaging satellites, the determination has been tortured and dynamic for three main reasons: human nature, an institutional lag between Cold War and globalization era policies, and technological development in the transition from the industrial age to the information age.⁴⁰

Regarding human nature, land is where humans live, work, play, and address all kinds of conflicts. Imaging the land therefore raises privacy, security, and economic issues that are less problematic when imaging oceans and the atmosphere. These aspects of land imaging encouraged Congress to ask in many sessions whether the institutional home for land imaging was more appropriately public or private, national or international.

In the 1970s, familiar Cold War rationales encouraged the United States to embark upon civil remote sensing.⁴¹ Just like with the *Apollo* program, the United States aimed to use its space technology to persuade nations to align with it in the then-bipolar world. Policymakers focused on the actual satellites, and they gave little thought to how the data would be stored, processed, and used.

Finally, the ability to understand and use image-processing technology lagged far behind the ability to understand, launch, and orbit a remote sensing satellite. Building and launching satellites is an industrial age “metal-bending” activity with which the U.S. aerospace industry had decades of experience. The seemingly more esoteric requirements of developing, marketing, and maintaining information-based technological products were beyond its ken. Initially, satellite-building companies bid for remote-sensing

³⁸ See Gabrynowicz, *supra* note 19, at 50–64.

³⁹ 15 U.S.C. § 5671 (Supp. II 2008).

⁴⁰ For a fuller discussion of this process, see Joanne Irene Gabrynowicz, *Space Law: Its Cold War Origins and Challenges in the Era of Globalization*, 37 SUFFOLK U. L. REV. 1041 (2004).

⁴¹ Gabrynowicz, *supra* note 19, at 48.

commercialization contracts as a means of selling satellites to the federal government. They thought only in terms of selling raw data, not information products. It was not until the 1990s when information-age industries could make dramatically increased computing power commercially available at concomitantly decreased costs that ground-based image processing began to look viable outside of government agencies.

The events that followed were analogous to a football game in which the opposing sides try to gain control of the ball before the end of a quarter. In this analogy, the teams were public federal agencies and private companies, and the ball was congressional authorization to process and make available to the public land satellite imagery and data. Each side asserted that it was the most appropriate entity to do so. Which side got the ball depended on the latest iteration of software technology and the last team who influenced Congress before the quarter, that is, session, ended.

From 1972 to 1984 no specific regulatory regime existed despite numerous attempts by Congress to enact a remote sensing law. Then, in 1984, the Commercialization Act⁴² was passed to commercialize the *Landsat* system, a federally funded series of Earth-observing satellites that had been in operation since 1972. This law provided for a three-phase process that began by privatizing the then-existing system through a government contract with a private company that would operate it. The second and third phases envisioned a privately built and funded system that would sell data to the federal government at first, but eventually would become a robust commercial environment with a number of thriving competitive companies that did not need government assistance. Because of the reasons discussed above, reality never progressed beyond the first phase. Therefore, driven by failed *Landsat* commercialization, the high cost of its data, and the reprioritization of national scientific goals, the 1984 law was replaced with the 1992 Land Remote Sensing Policy Act (Policy Act).⁴³

The Policy Act recognizes that *Landsat* data has value to researchers, educators, and nonprofit public interest entities. It returned the *Landsat* system to the public sector and set a minimum standard of making its unenhanced data available to U.S. government-supported researchers and agencies. The long-term objective goal was to make *Landsat* data fully available to all users at the cost of fulfilling user requests. This goal was achieved and surpassed when, in 2005, *Landsat* data was made available to all at no cost.⁴⁴ Thus, the Policy Act recognizes the commercial value of land remote sensing, but also acknowledges that commercialization of the *Landsat* program is unachievable within the foreseeable future and therefore

⁴² Land Remote-Sensing Commercialization Act of 1984, Pub. L. No. 98-365, 98 Stat. 451 (1984) (codified at 15 U.S.C. § 4201 (repealed 1992)).

⁴³ Land Remote Sensing Policy Act of 1992, Pub. L. No. 102-555, 106 Stat. 4163 (codified as amended at 15 U.S.C. §§ 5601–72).

⁴⁴ Press Release, U.S. Geological Survey, Orthorectified Landsat Digital Data Now Available From USGS (Dec. 27, 2005), available at <http://www.usgs.gov/newsroom/article.asp?ID=1425>.

is an inappropriate near-term national goal. Currently, medium-resolution *Landsat* data primarily benefits research concerning forestry, land management, and climate change—primarily public sector activities.

Attempts are underway to commercialize declassified high-resolution satellite technology that once was used only in government intelligence satellites. Two federally licensed private system operators currently use this technology, but they rely heavily on the federal government as an anchor client, each having a \$500 million government contract.⁴⁵ A new generation of follow-on satellites is in development, and at least one company claims it will be “independent of any formal U.S. Government commitment as an anchor customer.”⁴⁶ The success of these companies will largely depend on their ability to diversify their clientele and on continuing national security sensitivities.

D. 2000s: Regulatory Refinement

The first decade of the 2000s has been a time of regulatory refinement across all areas of U.S. national space law. To be sure, regulations have existed from space law’s inception. However, private space activities and the United States’ participation in some international activities have resulted in more detailed and revised regulations in the 2000s due to agencies’ growing experience and the lengthy, politically charged regulatory process. This section briefly addresses regulations for remote sensing, commercial human spaceflight, and U.S. participation in the *ISS*.

1. Remote Sensing

The U.S. Commerce Department’s National Oceanic and Atmospheric Administration is responsible for licensing and regulating private remote-sensing systems.⁴⁷ The first regulations were issued in 2000 and revised in 2006.⁴⁸ They are comprehensive and address all aspects of ground-based and space-based activities, including license terms and conditions, annual operational auditing and recordkeeping, a monitoring and compliance program, and notification of foreign agreements. Two issues concerning these regulations have attracted the most interest from observers. First, who can acquire the data generated by these systems? Second, can the government

⁴⁵ Press Release, GeoEye, ORBIMAGE Selected as NGA’s Second NextView Provider (Sept. 20, 2004), available at <http://geoeeye.mediaroom.com/index.php?s=43&item=76>; Press Release, DigitalGlobe, DigitalGlobe Awarded in Excess of \$500 Million NextView Contract (Sept. 30, 2003), available at www.media.digitalglobe.com/index.php?s=43&item=98.

⁴⁶ Colo. Space Coalition, GeoEye Contract With ITT Begins Procurement of GeoEye-2 Satellite, <http://www.spacecolorado.org/news/GeoEye-2.html> (on file with the Harvard Law School Library).

⁴⁷ See 15 U.S.C. § 5621 (Supp. II 2008).

⁴⁸ Final Rule on the Licensing of Private Land Remote-Sensing Space Systems, 15 C.F.R. §§ 960–960.15 (2009).

prevent a licensed operator from acquiring or distributing data in the first place?

As to the first issue, the Commercialization Act required that a policy called nondiscriminatory access be applied to both public and private operators. Nondiscriminatory access, like the rest of remote-sensing law, has a long and complex history.⁴⁹ It was originally a U.S. foreign policy intended to address the fears of economic and military espionage felt by nations whose territories could be imaged. Therefore, the Commercialization Act required that all data from *Landsat* and from federally licensed operators be made available to all who requested it; no one could be denied. However, the Policy Act modified the nondiscriminatory access policy, and now private operators are only required to make their data available to nations that request the imagery of their own territory.⁵⁰ Private operators can deny their data to anyone else for business reasons and any national security, foreign policy, or other reasons that are contained in the terms of their licenses. The nondiscriminatory access policy still applies in varying degrees to all data, depending on the amount of government funding involved.

The answer to observers' second question is yes: the government can prevent a licensed operator from acquiring or distributing data. This issue is addressed in a 2000 interagency Memorandum of Understanding Concerning the Licensing of Private Remote Sensing Satellite Systems.⁵¹ Normal commercial operations can be interrupted for national security or other national interests through a complex decision-making process called "shutter control," which may require a final determination by the President. Although the President did not become involved, after September 11, 2001, the federal government and a licensee entered into an exclusive contract that temporarily limited public access to imagery of Afghanistan and surrounding areas.⁵² At the time, many observers in the space community said that this agreement avoided regulatory shutter control, so they dubbed the agreement "checkbook shutter control."⁵³ Observers on the left accepted this new term because they believed that regulatory shutter control undermined the important principle of government transparency. Observers on the right accepted

⁴⁹ See generally Joanne Irene Gabrynowicz, *Defining Data Availability for Commercial Remote Sensing Systems Under United States Federal Law*, 23 ANNALS AIR & SPACE L. 93 (1998).

⁵⁰ See Land Remote Sensing Policy Act of 1992, Pub. L. No. 102-555, § 501, 106 Stat. 4163, 4176 (codified as amended at 15 U.S.C. § 5651 (Supp. II 2008)).

⁵¹ Fact Sheet Regarding the Memorandum of Understanding Concerning the Licensing of Private Remote Sensing Satellite Systems, 15 C.F.R. § 960 app. 2 (2000).

⁵² Michael R. Gordon, *A Nation Challenged: Public Information; Pentagon Corners Output of Special Afghan Images*, N.Y. TIMES, Oct. 19, 2001, at B2.

⁵³ THE NAT'L REMOTE SENSING & SPACE LAW CTR., *THE REMOTE SENSING INDUSTRY: A CEO FORUM 76-77* (John F. Graham & Joanne Irene Gabrynowicz eds., 2002), available at <http://www.spacelaw.olemiss.edu/publications/ceoforum.pdf>; Jennifer LaFleur, *Government, Media Focus on Commercial Satellite Images*, NEWS MEDIA & LAW, Summer 2003, at 37, available at <http://www.rcfp.org/newsitems/index.php?i=6048>; Peter de Selding, *Blanket Space Imagery Purchases by U.S. Gov't. Likely a Thing of the Past*, SPACE.COM, Oct. 16, 2002, http://www.space.com/news/wsc_observation_1016.html (on file with the Harvard Law School Library).

the term because they thought the regulation unduly interfered with private sector business interests. Both said regulatory shutter control never happened.

However, a close reading of the regulation shows that both sides are wrong: regulatory shutter control was successfully implemented and all but a few images were released to the public as soon as possible, giving rise to a presumption of openness. The regulation specifically provides that in order to limit licensees' activities for national security reasons, licensees "shall, on request, provide unenhanced restricted images on a commercial basis exclusively to the U.S. Government."⁵⁴ The result was an appropriate balance of the practical issues of national security and the presumptions of a free market and government transparency in an open society. In an era of sharply divided ideological politics, it is not surprising that disputes like this have made their way to space issues. Unfortunately, in this case, the balanced execution of law in a difficult situation that is likely to occur again has been lost in the fray.

2. *Commercial Human Space Flight*

Only three nations have successfully placed humans in space, all of whom have had the legal and professional status of "astronaut." Astronauts are specifically selected and trained to achieve scientific, engineering, or political space goals. Like all professionals working for their national governments, they are also paid employees. But many people who cannot become astronauts have dreamt of traveling into space. This desire, coupled with increased attempts to commercialize other space technology applications, has encouraged some entrepreneurs to pursue businesses that can bring people into space on a commercial, for-profit basis.

Space tourism, as it is colloquially called, currently consists of a number of activities. They range from \$7,000 rides on a modified Boeing 727 that performs parabolic arcs to create a weightless environment, to \$20 million orbital trips.⁵⁵ Suborbital flights, though yet to occur, are the most well-known type of space tourism and are offered by a number of companies. Virgin Galactic, perhaps the most flamboyant of the companies, joined forces with Burt Rutan and Scaled Composites to "form a new aerospace production company to build a fleet of commercial sub-orbital spaceships and launch aircraft."⁵⁶ In comparison, orbital opportunities are rare and require brokered agreements with government-funded facilities like the *ISS*.

⁵⁴ Licensing of Private Land Remote-Sensing Space Systems, 15 C.F.R. § 960.11(b)(4) (2009).

⁵⁵ See Zero G, Select Flight, <http://www.gozerog.com/index.cfm?fuseaction=reservations.welcome> (on file with the Harvard Law School Library); Space Adventures, Orbital Spaceflight, <http://spaceadventures.com/index.cfm?useaction=orbital.welcome> (on file with the Harvard Law School Library).

⁵⁶ Press Release, Scaled Composites, Branson and Rutan Form "The Spaceship Company" (July 27, 2005), available at http://www.scaled.com/news/2005-07-27_branson_rutan_spaceship_company.htm.

Russia has been the most active nation in this kind of tourist trip, but it recently announced that it would not be providing such opportunities for the foreseeable future because of ISS transportation needs.⁵⁷

Against this exciting and dynamic backdrop remains the fact that “[d]espite tantalizing commercial possibilities, the long-term technological and commercial viability of commercial human space flight . . . remains to be seen. Among the factors contributing to the industry’s ultimate success or failure will be the application of laws and the formulation of regulations governing the carriage of human beings into space.”⁵⁸

Federal regulations written after the passage of the Commercial Space Launch Act Amendments of 2004 require commercial suborbital flight operators to make several written informational disclosures in order to obtain the informed consent of customers, called “space flight participants” (SFPs).⁵⁹ “[SFPs] are excluded from indemnification eligibility under the 2004 Space Act and are not entitled to the benefits of liability insurance coverage.”⁶⁰ And, because commercial suborbital human spaceflight technology lacks an established track record, it is still unclear what information operators must give SFPs so that they are “informed.” What is clear, however, is that SFPs, not operators, bear the risks and must be so informed. “There is no doubt that Congress and the federal oversight agency are trying to establish a ‘risk shifting’ regime as between the SFP and the operator *if* adequate information is delivered from the operator to the SFP.”⁶¹ Further, because of SFPs’ likely deep pockets, “it is not unreasonable to expect that a wealthy space flight participant would be named as a defendant in the event of damage claims brought by an injured third party.”⁶² Given this risk-shifting regime, it is crucial that suborbital space flight operators obtain the SFPs’ informed consent—whatever that may be.

Finally, an interesting and important point about space tourism concerns the science upon which the commercial human spaceflight law is based. Current laws and regulations address only suborbital flight, that is trips during which ships leave Earth, go beyond air space to a very high altitude, and then return to Earth, but do not enter into an orbit around Earth. Based on distinctions in physics between the “lift” and “thrust” needed to accomplish such a trip, the law classifies commercial space tourism ships as rockets, not aircraft. It may be expected that as the industry matures, there will be some questions raised about this definition and whether the industry

⁵⁷ Dmitry Solovyov, *Russia Halts Space Tours as U.S. Retires Shuttle*, REUTERS, Mar. 3, 2010, <http://www.reuters.com/article/idUSTRE6223VF20100303> (on file with the Harvard Law School Library).

⁵⁸ Timothy Robert Hughes & Esta Rosenberg, *Space Travel Law (and Politics): The Evolution of the Commercial Space Launch Amendments Act of 2004*, 31 J. SPACE L. 1, 3 (2005).

⁵⁹ 14 C.F.R. § 460.45 (2009).

⁶⁰ Hughes & Rosenberg, *supra* note 58, at 59.

⁶¹ Tracey Knutson, *What Is “Informed Consent” for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?*, 33 J. SPACE L. 105, 108 (2007).

⁶² Hughes & Rosenberg, *supra* note 58, at 59.

should be regulated by international aviation law and institutions rather than national space law.⁶³ However, for the foreseeable future the U.S. commercial space flight industry will be regulated by national space law.

3. *International Space Station Code of Conduct*

The laws governing the complex activities at the *ISS* demonstrate the interplay between national and international space law. The *ISS* generally is governed by international law as described in the *ISS* Intergovernmental Agreement (IGA).⁶⁴ However, policy decisions regarding participation in *ISS* activities are made at the national level by the individual partner countries, including the United States. As a more specific example, the IGA includes a Code of Conduct for the *ISS* crew that was developed and approved by the partner countries.⁶⁵ However, each partner retains jurisdiction and control over its personnel and station elements and therefore implements the Code at its own national level. In the United States, the Code has become part of the terms and conditions of the U.S. astronauts' employment and applies to all NASA-provided persons, including federal employees, members of the armed services, U.S. citizens who are not federal employees, and foreign nationals.⁶⁶ In this way, national and international laws are intricately intertwined.⁶⁷

II. 2009: CODIFICATION—THE BRIDGE FROM THE 20TH TO THE 21ST CENTURY

As the above discussion describes in an abridged manner, a substantial amount of U.S. national space law has been enacted over the past half century. All of it was passed after 1926, the year that United States Code was organized. Therefore, the Code contains no separate space law title. When each statute was written, it was placed in a Code title deemed relevant to the particular activities covered by the statute. Some of the provisions are in Title 15—Commerce and Trade, some in title 42—Public Health and Welfare, and some in Title 49—Transportation.

In 2009, the Office of Law Revision Counsel provided the U.S. House of Representatives Committee on the Judiciary with a proposed bill to im-

⁶³ See, e.g., Ruwantissa Abeyratne, *ICAO's Involvement in Outer Space Affairs—A Need for Closer Scrutiny?*, 30 J. SPACE L. 185 (2004).

⁶⁴ Agreement Among the Government of Canada, Governments of the Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of The United States of America Concerning Cooperation on the Civil International Space Station, art. 1, Jan. 29, 1998, State Dep't No. 01-52, 2001 WL 679938.

⁶⁵ *Id.* art. 11.2.

⁶⁶ 14 C.F.R. § 1214.401 (2010).

⁶⁷ See generally A. Farand, *The Code Of Conduct for International Space Station Crews*, EUR. SPACE AGENCY BULL., Feb. 2001, at 64, available at http://www.esa.int/esapub/bulletin/bullet105/bul105_6.pdf.

prove the structure of U.S. national space law.⁶⁸ The bill gathers and restates the laws regarding the national and commercial space programs in a new Title 51—National and Commercial Space Programs, but does not modify the existing laws in any other way. It restates existing law according to the policy, intent, and purpose of the original statutes and improves the law's organizational structure while removing ambiguities and contradictions.

Codification of U.S. national space law is significant for two reasons. First, it demonstrates the maturity of a body of law that was distinctly the product of the twentieth century and the expectation that it will continue to evolve going forward. Codification will also make U.S. national law more accessible to other nations as a model for developing their own space law. Significant segments of U.S. space law, such as shutter control and maximum probable loss, are already the de facto standard for other nations; and scholars in the newly active space nations of the Pacific Rim have also identified U.S. law as a possible model for their emerging space law.⁶⁹

At the time of this article's publication, the codification bill has been passed by the House of Representatives and awaits action by the Senate.

III. THREE LONG-TERM EMERGING ISSUES

A. *State Space Law*

Anticipating that commercial human space flight will become a lucrative business, a number of U.S. states have begun plans to establish spaceports and associated physical and institutional infrastructure to accommodate the nascent industry. Currently, nine states have legislation authorizing various activities to support the establishment of a spaceport or related activities within their jurisdictions: Alaska, California, Florida, Hawaii, New Mexico, Oklahoma, Texas, Virginia, and Wisconsin.⁷⁰ The kind and degree of activities vary widely, but they all aim to attract space tourism to the given state as an economic development strategy. Therefore, the state laws contain a variety of incentives that are tailored to the needs of each particular state. Some, like California, Florida, Texas and Virginia, contain actual spaceport incentives in order to leverage existing government facilities.⁷¹ Others, like Oklahoma, establish wider-ranging space authorities.⁷² Tax advantages are a major feature of New Mexico's law.⁷³ Some states, like New Mexico,⁷⁴ are offering attractive liability regimes to address the doctrine of informed consent in a manner that is favorable to the industry.

⁶⁸ H.R. 3237, 111th Cong. (as passed by House, Jan. 13, 2010).

⁶⁹ See Colloquium, *Pacific Rim National Space Law Summit*, 36 J. SPACE L. 363 (2009).

⁷⁰ See, e.g., ALASKA STAT. § 14.40.821 (2009); HAW. REV. STAT. § 201-73 (2009); WIS. STAT. ANN. § 114.63 (West 2010).

⁷¹ CAL. GOV'T CODE § 13999.2(a) (West 2009); FLA. STAT. § 331.302 (2010); TEX. LOC. GOV'T CODE ANN. §507 (2010); VA. CODE ANN. § 2.2-2201 (West 2009).

⁷² OKLA. STAT. ANN. tit. 74 § 5203 (2009).

⁷³ N.M. STAT. ANN. § 58-31-4 (2010).

Together, these laws have begun to build a body of individual state space law. Initially, states are analogizing spaceports to airports. In many instances, that analogy is reasonable, and relationships among local, state, and federal authorities can be forged using the airport model. However, as spaceports develop, it may be necessary to take into consideration some factors that are inapplicable to airports. As discussed below, chief among these factors is Article VI of the Outer Space Treaty, which makes the U.S. government responsible for continually supervising all U.S. nongovernmental space actors.⁷⁵ As a result, the federal government may need to supervise activities stemming from spaceport operations more closely than for aviation. Looking further into the future, and envisioning multiple active spaceports in different states, the federal government may need to invoke the Constitutional doctrine of preemption to ensure the United States meets its treaty obligations.⁷⁶

B. *Licensing Commercial Orbital Flights*

Over the years, Congress has granted incremental jurisdiction to the DoT's Federal Aviation Administration (FAA) for licensing commercial space flights. When launch technology only brought objects into space, Congress granted the FAA authority to license launches in the 1984 Launch Act.⁷⁷ Then when launch technology was developed to bring payloads into space and return them, Congress granted the FAA reentry licensing authority in 1988.⁷⁸ The FAA therefore has jurisdiction to launch what goes up and what comes down, but it does not yet have jurisdiction to license a commercial object that remains in orbit for a period of time.⁷⁹

Assuming that technology is being developed to successfully provide orbital flight on a commercial basis, then based on Congress' previous grants of jurisdiction, it is reasonable to expect that it will grant orbital licensing jurisdiction in the future.⁸⁰ If so, this would be a substantial departure from previous jurisdictional grants because, unlike suborbital flights, orbital flights will clearly operate in international territory. Therefore, national ju-

⁷⁴ On February 27, 2010, New Mexico Governor Bill Richardson signed into law New Mexico Senate Bill 9, Space Flight Informed Consent Act, S.B. 009, 49th Leg., 2d Sess. (N.M. 2010).

⁷⁵ Outer Space Treaty, art. 6, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.

⁷⁶ *Interview: Timothy Hughes, SpaceX Chief Counsel*, RES COMMUNIS, Jan. 14, 2008, <http://rescommunis.wordpress.com/2008/01/14/interview-timothy-hughes-spacex-chief-counsel> (on file with the Harvard Law School Library).

⁷⁷ Commercial Space Launch Act, Pub. L. No. 98-575, § 7, 98 Stat. 3055, 3058 (1984) (codified as amended at 49 U.S.C. § 70101 (Supp. II 2008)).

⁷⁸ Commercial Space Act of 1998, Pub. L. No. 105-303, 112 Stat. 2843.

⁷⁹ Hughes & Rosenberg, *supra* note 58, at 49-50.

⁸⁰ Some have expressed the view that it should be NASA, not the FAA, that ought to be given jurisdiction over commercial orbital flight. As of this writing, this is still a nascent issue. See Video: Space Exploration and Policy and Programs (C-Span 2010), <http://www.c-spanvideo.org/program/292791-1> (last viewed May 14, 2010).

isdiction for commercial orbital operations must be considered within the context of international space law.

Space, like the Antarctic and the high seas, is a global commons. However, unlike with the other global commons, the international law that governs space developed rapidly—within months rather than decades or centuries. It was a scant ten months from the end of Outer Space Treaty negotiations to its entrance into force in 1967. Another four space treaties entered into force in under twenty years.⁸¹ The speed with which the international community established this treaty regime demonstrates a clear intent that space was to be governed by international law.

Initially, different countries had competing definitions as to what kind of entities were appropriate actors in the space commons. The Soviet Union argued that only nation-states could act in space while the United States argued that private entities could also be valid space actors. This conflict led to one of the most important compromises in all of space law: Article VI of the Outer Space Treaty which provides that “activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”⁸² This provision recognizes the right of private actors to be in space and to conduct space activities while at the same time providing oversight to ensure that their actions conform to international law.

The United States meets its Article VI supervisory responsibility through the federal licensing regulations established to regulate private space activities. A logical question, then, is whether the national licensing process for commercial orbital flights will be consistent with international law. To be consistent, the licensing process must address a number of considerations, the most important of which is the non-appropriation principle of the Outer Space Treaty. The Treaty states that outer space “is not subject to national appropriation by claim of sovereignty.”⁸³ Therefore, when exercising sovereign authority and responsibility to grant licenses for commercial orbital activities, the United States must clearly state that the act of granting a license does not constitute appropriation of the given orbit. The *ISS IGA* offers a precedent for this necessary caveat, stating, “Nothing in this Agreement shall be interpreted as . . . constituting a basis for asserting a claim to national appropriation over outer space or over any portion of outer space.”⁸⁴ Additionally, licenses for nongovernmental commercial orbital operations cannot constitute indirect national appropriation due to the Outer Space Treaty’s prohibition of appropriation “by any other means.”⁸⁵ Therefore the

⁸¹ See Brian Beck, *The Next, Small Step for Mankind: Fixing the Inadequacies of the International Space Law Treaty Regime to Accommodate the Modern Space Flight Industry*, 19 ALB. L.J. SCI. & TECH. 1, 10–11 (2009).

⁸² Outer Space Treaty, *supra* note 75.

⁸³ *Id.* art. 2.

⁸⁴ Agreement Concerning Cooperation on the Civil International Space Station, art. 2, Jan. 29, 1998, T.I.A.S. No. 12927.

⁸⁵ Outer Space Treaty, *supra* note 75, art 2.

license must include additional language to clarify that the licensed use of an orbit by a private entity also does not constitute national appropriation.

This potential license language addresses national appropriation, but not appropriation by nongovernmental entities. There are some observers who contend that nongovernmental appropriation is permitted by the space law regime, but the international opinion is strongly of the opposite view.⁸⁶ On an analogous topic, an authoritative opinion from within the U.S. State Department states that “private ownership of an asteroid is precluded by Article II of the [Outer Space] Treaty.”⁸⁷ It is reasonable to expect that this position will be applied to an orbit, and so a U.S. orbital licensing regime will, at a minimum, have to account for this.

C. *Evolving Definition of “Commercial”*

The definition of the term “commercial” has a long and dynamic history in the aerospace industry. In the United States, the industry emerged from World War II, the necessities of which caused the dramatic growth of individual prewar companies like the McDonnell Aircraft Corporation and Douglas Aircraft Company.⁸⁸ In the postwar years, Cold War space and military activities created incentives for these entities to merge into aerospace manufacturers and defense contractors like the McDonnell Douglas Corporation.⁸⁹ But the end of the Cold War decreased demand, and a further wave of mergers left remaining only a few aerospace giants like the Lockheed Martin Corporation and The Boeing Company.⁹⁰

Since the 1950s, the U.S. government and aerospace contractors have maintained a close relationship in which the government has awarded contract work through a complex mix of merit, technology, and politics in order to achieve both specific missions and to maintain a vibrant industrial base. All the while, both sides have maintained that the industry operates on a commercial basis—that is, the public and private sectors are separate, and

⁸⁶ Compare Alan Wasser & Douglas Jobe, *Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate it Needs to Survive?*, 73 J. AIR L. & COMMERCE 72 (2008), with Press Release, International Institute of Space Law, Statement of the Board of Directors of the International Institute of Space Law (IISL) (Mar. 22, 2009), available at http://www.iislweb.org/html/20090322_news.html.

⁸⁷ Letter to Gregory William Nimitz from Ralph L. Braibanti, Dir., Space & Advanced Tech., U.S. Dep’t of State, Bureau of Oceans & Int’l Envtl Affairs, (Aug. 15, 2003), quoted in *OrbDev Appeals to State Dept for Eros Rent Ruling*, SPACE DAILY, Aug. 28, 2003, <http://www.spacedaily.com/news/asteroid-03k.html> (on file with the Harvard Law School Library).

⁸⁸ See Boeing, McDonnell Aircraft Corp. . . . Preparing for the Phantom, www.boeing.com/history/narrative/n028mcd.html (on file with the Harvard Law School Library); Boeing, The Douglas Aircraft Co. . . . Building Up for War, <http://www.boeing.com/history/narrative/n026dou.html> (on file with the Harvard Law School Library).

⁸⁹ See Boeing, The McDonnell Douglas Corp. . . . Merging Talents, www.boeing.com/history/narrative/n063mcd/html (on file with the Harvard Law School Library).

⁹⁰ See Lockheed Martin, Lockheed Martin History, <http://www.lockheedmartin.com/aboutus/history/index.html> (on file with the Harvard Law School Library); Boeing, The Boeing Company . . . The Giants Merge, www.boeing.com/history/narrative/n079boe.html (on file with the Harvard Law School Library).

the public sector sets work requirements that the private sector fulfills on a for-profit basis.⁹¹ In comparison, since Europe's aerospace industry came of age in the 1970s with the Convention for the Establishment of a European Space Agency (Convention),⁹² European governments have commonly engaged in commercial aerospace activities. For Europeans, a commercial activity is simply one that generates revenue and in which it is appropriate for governments to engage.⁹³ By contrast, in the United States, commercial activities are synonymous with the private sector, and there is a strong bias against governments engaging in commercial activities. As a result, the U.S. aerospace industry often calls for a level playing field—that is, a marketplace in which it does not have to compete with commercial activities conducted by governments.⁹⁴ The standing European response is to point out that the U.S. government supplies and funds critical space infrastructure and provides exclusive contracts to U.S. aerospace companies, thus placing the companies in the same position as their European counterparts.

A variation on this theme relates to industrial policy. Industrial policy is a country's planned, strategic effort to develop a particular sector of industry. In the view of the U.S. aerospace industry, industrial policy is anathema to free market principles and results in misguided attempts by a government to choose winners and losers. In the European view, industrial policy is simply a cooperative effort between government and industry to promote the national interest. In fact, industrial policy is the legal reason for aerospace cooperation among nations within Europe.⁹⁵

Some observers have noted the close and interrelated relationship between the U.S. government and aerospace industry and find relatively little difference between the two views.⁹⁶ Recent legislative efforts to define the term "commercial" lend credence to these observations as these efforts demonstrate that some lawmakers believe it is necessary to delineate a difference between government and private commercial activities.⁹⁷

Historically, aerospace activities have, by and large, been segregated into national programs. International cooperative missions have consisted of discrete tasks and interactions that do not involve the exchange of funds. As a result, the debate over what is commercial has retained its familiar con-

⁹¹ See Frans G. von der Dunk, *The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources*, 32 ANNALS AIR & SPACE L. 91, 93 (2007).

⁹² Convention for the Establishment of a European Space Agency (ESA), May 30, 1975, 14 I.L.M. 864 [hereinafter ESA Convention], available at <http://www.esa.int/convention/>.

⁹³ von der Dunk, *supra* note 91, at 93.

⁹⁴ See, e.g., U.S. GOV'T ACCOUNTABILITY OFFICE, U.S. AEROSPACE INDUSTRY: PROGRESS IN IMPLEMENTING AEROSPACE COMMISSION RECOMMENDATIONS, AND REMAINING CHALLENGES 26–29 (2006), available at www.gao.gov/cgi-bin/gettrpt?GAO-06-920; TRENDS AND CHALLENGES IN AEROSPACE OFFSETS 33 (Charles W. Wessner ed., 1999).

⁹⁵ ESA Convention, *supra* note 92, art. VII.

⁹⁶ See, e.g., ROBERT B. REICH, *THE WORK OF NATIONS: PREPARING OURSELVES FOR 21ST CENTURY CAPITALISM* 156–57 (1992).

⁹⁷ See NASA Authorization Act, Pub. L. No. 106-391 §§ 303, 309, 114 Stat 1577, 1593 (2000); Human Space Flight Capability Assurance and Enhancement Act, H.R. 4804, 111th Cong. § 8 (2010).

tours for decades. However, the debate is about to get more interesting. In 2010, the *Shuttle* is being retired,⁹⁸ and the Obama Administration's fiscal year 2011 budget for NASA's space exploration program envisions increased reliance on the U.S. private sector and innovative contracting practices to provide, among other things, transportation to and from the recently completed *ISS*.⁹⁹ The plan increases NASA's budget by billions of dollars and at the same time increases private sector involvement in national space programs. Predictably, the plan is very controversial, and its chance for success is uncertain.

Nonetheless, one can expect that this new direction and the need for new technologies will continue the globalization-era transformation of the U.S. space program, including the relationship between NASA and the aerospace industry and the contours of that industry. As for the NASA-industry relationship, in recent years both public and private entities have seen new forms of contracting in which procurements, payments, and performance milestones have been recast to "facilitate a smooth transition into commercialization."¹⁰⁰ Regarding the industry's makeup, the "buy national" policies of the Cold War have given way to an incremental inclusion of non-U.S. subcontractors that now provide important technologies for major U.S. general contractors, even for national security launches that have never before been commercially available to non-U.S. suppliers.¹⁰¹

These changes and the new space exploration direction suggest that primarily business decisions will replace the primarily geopolitical decisions that defined the Cold War space program. If so, then the debate surrounding the definition of "commercial" is about to take on new dimensions that are unlikely to go as far as designating a foreign prime contractor for critical U.S. needs, but will transform actors and agreements in arrangements that are yet to be recognized as "commercial."

CONCLUSION

At the dawn of the twentieth century, airplanes had not yet flown and spacecraft not yet been conceived. Yet, well before the century's end—in less than one-quarter of the United States' national existence—humans were on the Moon. On our way to the Moon, we learned that space could be used to improve and support life on Earth. It is impossible to address in a single article all of the important emerging space activities that must be supported

⁹⁸ Damien Cave, *Celebrating U.S. Future in Space, Hopefully*, N.Y. TIMES, Apr. 27, 2010, at A14.

⁹⁹ See President Barack Obama, Address at Kennedy Space Center (Apr. 15, 2010) (transcript and recording available at http://www.nasa.gov/about/obama_ksc_pod.html).

¹⁰⁰ Tiphany Baker Dickerson, *Patent Rights Under Space Act Agreements and Procurement Contracts: A Comparison by the Examinations of NASA's Commercial Orbital Transportation Services (COTS)*, 33 J. SPACE L. 341, 343 (2007).

¹⁰¹ See, e.g., Press Release, Lockheed Martin, Atlas V Team Wins Achievement Award from U.S. Space Foundation (Apr. 1, 2003), available at http://www.lockheedmartin.com/news/press_releases/2003/AtlasVTeamWinsAchievementAwardFromU.html.

by a new or extended legal foundation. Among these important issues are orbital debris and maintenance of the near-Earth space environment, real and intellectual property rights in space, space-based solar power, human settlements in the solar system, and growing commercial applications, to name just a few.

It is also impossible to assert what the Constitution's Framers would have thought about space activities.¹⁰² However, in designing the constitutional system to "form a more perfect Union" and to "promote the general Welfare" for themselves and for us, their "Posterity,"¹⁰³ they provided a legal system robust and flexible enough to accommodate what was inconceivable to the eighteenth century mind: human beings living and working in outer space. Perhaps more than any other area of law, space law has demonstrated how the Constitution requires each generation to articulate anew what it means to "secure the Blessings of Liberty."¹⁰⁴

To design and implement future space activities and space law, the United States will have to carefully consider its national interests and determine how they are aligned with the interests of other nations and shared with global interests. In the interconnected world of the twenty-first century, the "one-nation-go-it-alone" model of *Apollo* is becoming increasingly anachronistic. The ongoing lessons and experiences of the partnership model employed in the *ISS* have the potential to show the way to a "humans-from-Earth" model for missions to Mars and beyond. Perhaps along the way, new forms of commerce and industry will manifest, leading to a new, and more equitably shared, level of prosperity.

The promise of space requires the informed citizenry that Jefferson recognized as the prerequisite to democracy.¹⁰⁵ To foster this citizenry, the United States must continue to provide affordable public education and private opportunities, such as the Intel Science Talent Search won in 2010 by eighteen-year-old Erika DeBenedictis who created an original algorithm that identifies energy minimizing routes for spacecraft.¹⁰⁶ With continued commitments like this, the Union will continue to be more perfect on Earth and in space.

¹⁰² However, it is the author's opinion that Thomas Jefferson would have been a major advocate of space activities. Remote sensing would have been an important tool in his agrarian society, GPS would have been an important tool in the Northwest Ordinance, and the sponsor and architect of the Lewis and Clark expedition would understand the attraction of space exploration. To be sure, George Washington, the surveyor, would have also appreciated GPS.

¹⁰³ U.S. CONST. pmbl.

¹⁰⁴ *Id.*

¹⁰⁵ See Letter from Thomas Jefferson, *supra* note 1.

¹⁰⁶ News Release, Intel, Intel Science Talent Search 2010 Winners Announced (Mar. 16, 2010), available at <http://www.intel.com/pressroom/archive/releases/20100316edu.htm>.