

U.S. Commercial Space Regulation: The Rule of Three

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Abstract

The rule of three is the idea that an ideal commercial space regulatory environment is one that satisfies three policy objectives: Promote industry growth, satisfy international obligations, and preserve national security. The rule of three provides a framework both for understanding and designing commercial space regulatory environments and for assessing whether they are adequate and effective or, instead, deficient and unable to meet policy goals.

Part one provides a brief background on existing regulatory regimes comprising the broad commercial space regulatory environment. It explains what space activities are covered, with a focus on the activities of payloads on orbit. It discusses the role of the Federal Communications Commission (FCC) in the regulation of frequency use and the role of Commerce Department's National Oceanic and Atmospheric Agency (NOAA) in the regulation of private remote sensing. In addition, it identifies regulatory gaps and discusses a potential stop-gap regulatory measure known as the Mission Authorization framework for near-future or otherwise unregulated space activities.

Part two describes the components of the rule of three and their derivation. These three components are not novel. Rather, they are drawn from recent space policies and applicable international law, particularly Space Policy Directive 2, *Streamlining Regulations on Commercial Use of Space*, issued in 2018, and the National Space Policy, issued in 2020, as well as the Outer Space Treaty of 1967.¹

Part three applies the rule of three to two case studies: commercial remote sensing and commercial radiofrequency (RF) collection. It argues the commercial remote sensing regulatory environment is sound and effective because each of the three policy objectives are satisfied and appropriately balanced. The commercial RF regulatory environment, by contrast, has regulatory gaps. The gaps undermine the rule of three, thereby hindering the ability of the United States to achieve its stated policy goals. These case studies demonstrate how current and future commercial space regulatory environments can be evaluated by whether they reflect and adhere to the rule of three.

The conclusion offers three observations drawn from the case studies that can aid policy makers in the application of the rule of three.

I. U.S. Commercial Space Regulatory Mechanisms and Gaps

A. Licensing Mechanisms

The domestic commercial space regulatory regime in the United States comes in two general categories: regulation of launch and regulation of payload operations.² The Department of Transportation, through the Federal Aviation Administration (FAA), regulates commercial space launch. The Federal Communications Commission (FCC) and the Department of Commerce implement the current regulatory regimes for payloads.

* The views expressed are solely those of the author and do not reflect the position of the U.S. Government, the Department of Defense, or the National Geospatial-Intelligence Agency.

¹ THE WHITE HOUSE, SPACE POLICY DIRECTIVE-2, STREAMLINING REGULATIONS ON COMMERCIAL USE OF SPACE (2018), 83 Fed. Reg. 24901 [hereinafter SPD-2]; THE WHITE HOUSE, NATIONAL SPACE POLICY (2020), 85 Fed. Reg. 81755 [hereinafter 2020 NSP]; Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies art. VI, January 27, 1967, 19 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

² Susan Trepczynski, *New Space Activities Expose a Potential Regulatory Vacuum*, 43 THE REPORTER 12, 14 (2016).

The FCC regulates the non-Federal use of frequencies in the United States. It is an independent government agency overseen by Congress and authorized under the Communications Act of 1934, as amended, to regulate communications laws and regulations, including satellite communications.³ An FCC license is required for the “transmission of energy or communications or signals” by space stations (i.e., satellites).⁴ In effect, every U.S. satellite requires an FCC license because every satellite requires the ability to transmit command and control signals with a ground station in order to operate. In addition to regulating which frequencies satellites use to communicate, FCC licenses also impose conditions to mitigate the creation of orbital debris.⁵ The FCC’s authority to impose orbital debris mitigation plans derives from its statutory obligation to regulate radiocommunications in a manner that encourages the effective use of radio in the public interest.⁶

The Department of Commerce, through the National Oceanic and Atmospheric Agency (NOAA), regulates private remote sensing. The basis for domestic regulation of private remote sensing in the United States is the Land Remote Sensing Policy Act of 1992.⁷ The Act authorizes the Secretary of Commerce to license private sector parties to operate private remote sensing space systems.⁸ The law requires any person under the jurisdiction or control of the United States, either directly or through a subsidiary or affiliate, to obtain a license to operate a private remote sensing space system.⁹ Licensees are required to comply with the basic conditions set forth in the Act, any regulations issued in furtherance of the Act, and any applicable international obligations and national security concerns of the United States.¹⁰

NOAA implements the Land Remote Sensing Policy Act through rules codified in the Code of Federal Regulations (CFR).¹¹ Every licensed operator is subject to standard licensing conditions, regardless of their satellite’s capability.¹² Operators with remote sensing capabilities not available from other operators may be subject to additional licensing conditions.¹³ These conditions are addressed further in Section 3.A. At present, 44 commercial companies hold NOAA remote sensing licenses, about half of which have one or more satellites currently on orbit.¹⁴ Over two dozen academic institutions also hold NOAA licenses.

B. Regulatory Gaps and Mission Authorization

The existing licensing regime has some gaps, particularly when it comes to new or anticipated on-orbit commercial space activities. Put simply, some commercial activities fall, or will fall, outside the scope of FCC and NOAA licenses. The United States has made halting efforts to address this regulatory gap, but these efforts remain a work in progress.

In November 2015, President Obama signed into law the U.S. Commercial Space Launch Competitiveness Act (the Competitiveness Act).¹⁵ While perhaps best known for declaring the ability of citizens to assert private property rights in resources mined from the Moon, the Competitiveness Act also sought to take an initial step towards

³ Communications Act of 1934, 47 U.S.C. §§ 151 *et seq.*

⁴ 47 C.F.R. § 25.102(a).

⁵ Mitigation of Orbital Debris in the New Space Age, 85 Fed. Reg. 52422 – 52454 (2020).

⁶ See *FCC Fact Sheet: Mitigation of Orbital Debris in the New Space Age*, IB Docket No. 18-313 (April 2, 2020) at 8 (providing FCC’s analysis of its statutory authority extending to debris mitigation).

⁷ Land Remote Sensing Policy Act of 1992, Pub. L. No. 102-555. This Act replaced the Land Remote-Sensing Commercialization Act of 1984, Pub. L. No. 98-365.

⁸ 51 U.S.C. § 60121(a)(1).

⁹ 51 U.S.C. § 60122(a).

¹⁰ 51 U.S.C. § 60121(a)(1).

¹¹ Licensing of Private Remote Sensing Systems, 85 Fed. Reg. 30790 (2020), 15 C.F.R. § 960 *et. seq.*

¹² *Id.* at § 960.8.

¹³ *Id.* at § 960.9-10.

¹⁴ LICENSEES, NOAA NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE (NESDIS), <https://www.nesdis.noaa.gov/commercial-space/regulatory-affairs/licensing/noaa-licensees> (last visited July 18, 2022).

¹⁵ U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 703 (2015).

addressing the regulatory gap for commercial space activities. Specifically, the Competitiveness Act directed the Director of the Office of Science and Technology Policy, in consultation with the Secretary of State, the Secretary of Transportation, the Administrator of NASA, the heads of other relevant agencies, and the commercial space sector, to “assess current, and proposed near-term, commercial non-governmental activities conducted in space” and “identify appropriate authorization and supervision authorities” for those activities.¹⁶

The Office of Science and Technology Policy (OSTP) submitted a report of its assessment on April 4, 2016.¹⁷ It identified three categories of “unprecedented commercial space activities planned by American companies”: private missions beyond Earth’s orbit, new on-orbit activities, and space resource utilization.¹⁸ The non-exclusive list of new on-orbit activities identified included:

- End-of-life extension modules, which attach to a satellite to aid in station-keeping or transfer to graveyard orbits;
- Satellite repair utilizing robotic arms;
- Satellite refueling utilizing fuels launched from Earth;
- Satellite refueling utilizing fuels derived from space resources; and
- Commercial orbital habitats.¹⁹

The OSTP report recommended using a “Mission Authorization” framework for regulating new U.S. commercial space activities and included in an appendix a legislative proposal to implement the framework.²⁰

The Mission Authorization proposal was modeled after the Federal Aviation Administration’s (FAA) payload review process. Under that process, “the FAA would coordinate an interagency process in which the designated agencies would review a proposed mission in relation to specified government interests, with only such conditions as necessary for fulfillment of those government interests.”²¹

The intent of the Mission Authorization proposal is not to “establish a comprehensive regulatory framework” but rather to “establish a process no more burdensome than is necessary to enable the United States Government to authorize these pioneering space activities in conformity with its treaty obligations, and to safeguard core public interests, such as national security.”²²

The 2020 National Space Policy renewed the call for Mission Authorization to fill regulatory gaps after Congress did not act on the recommendations in the 2016 report. Under the heading “Mission Authorization for Novel Activities” the policy directs the Secretary of Commerce, in coordination with the National Space Council, to:

- Identify whether any planned space activities fall beyond the scope of existing authorization and supervision processes necessary to meet international obligations; and
- Lead, if necessary, the development of minimally burdensome, responsive, transparent, and adaptive review, authorization, and supervision processes for such activities, consistent with national security and public safety interests, with a presumption of approval and a prompt appeals process.²³

As discussed further below, the 2015 Competitiveness Act, the Congressionally-directed 2016 White house report, and the 2020 National Space Policy all expressly refer to “authorization” and “supervision” of commercial space activities – a direct invocation of international obligations derived from the 1967 Outer Space Treaty.

¹⁶ *Id.*, at § 108.

¹⁷ EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, LETTER SUBMITTED IN FULFILLMENT OF A REPORTING REQUIREMENT CONTAINED IN THE U.S. COMMERCIAL SPACE LAUNCH COMPETITIVENESS ACT. (April 4, 2016) [hereinafter OSTP Report], https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla_report_4-4-16_final.pdf

¹⁸ *Id.*, at 2.

¹⁹ *Id.*

²⁰ *Id.* at 4, 6-7.

²¹ *Id.* at 4.

²² *Id.*

²³ 2020 NSP, *supra* note 1, at 81766.

To date, a Mission Authorization process has not been codified in law or regulation. According to one expert, this is “due to political forces that attempted to eliminate most authorizing legislation.”²⁴

II. Policy Objectives – The Rule of Three

Three policy objectives guide the regulation of commercial space activities: 1) Promote the growth of the commercial industry in the United States; 2) Satisfy the international obligations of the United States; and 3) Preserve national security. These objectives inform the rule of three: An ideal regulatory environment will account for each of the three policy objectives in appropriate measure. Failure to adhere to the rule of three is an indicator of a sub-optimal regulatory environment.

A. Promote Industry Growth

The first, and most discussed, policy objective is the goal of promoting the growth of the United States commercial space industry. Numerous policies identify this as the primary objective in any commercial space regulatory environment.

Space Policy Directive-2 declared commercial space regulations should “promote economic growth” and “encourage American leadership in space commerce.”²⁵ The Directive helped spur the revision to the rules governing commercial remote sensing licensing, as discussed further in Part III.A.

The 2020 National Space Policy also articulates the posture of the United States towards commercial space. As a foundational principle, it recognizes that United States leadership in space is dependent upon a strong commercial space sector. “A robust, innovative, and competitive commercial space sector is the source of continued progress and sustained United States leadership in space,” it says.²⁶ It elaborates:

The United States remains committed to encouraging and facilitating the continued growth of a domestic commercial space sector that is globally competitive, supports national interests, and advances leadership in the generation of new markets and innovation-driven entrepreneurship.²⁷

In furtherance of this principle, the National Space Policy sets the goal of “[p]romot(ing) and incentiviz(ing) private industry to facilitate the creation of new global and domestic markets” and “strengthen(ing) and preserv(ing) the position of the United States as the global partner of choice for international space commerce.”²⁸

In the United States, space activities are divided into three sectors: the civil sector, the commercial sector, and the national security sector. The National Space Policy includes guidelines for each sector, as well as specific cross-sector guidelines applicable to the heads of all agencies. The commercial sector guidelines underscore the connection that commercial space has to broader national strategic objectives, including national security. “A United States commercial space sector that leads in the global space marketplace,” it states, “is foundational to national strategic objectives that includes increased and sustained prosperity, free market principles, enhanced international partnerships and collaboration ... and is vital to United States and allied security.”²⁹

Regulation plays a fundamental role in encouraging – or discouraging – industry growth. The Space Priorities Framework, issued in 2021 under the Biden Administration, prioritizes a “regulatory environment that enables a competitive and burgeoning U.S. commercial space sector.”³⁰ Achieving the ideal regulatory environment is

²⁴ Space Situational Awareness: Key Issues in an Evolving Landscape: Hearing Before Subcommittee on Space and Aeronautics of the Committee on Science, Space, and Technology United States House of Representatives, 116th Cong. (2020) (Written testimony of Joanne Irene Gabrynowicz).

²⁵ SPD-2, *supra* note 1, at 24901.

²⁶ 2020 NSP, *supra* note 1, at 81755.

²⁷ *Id.* at 81756

²⁸ *Id.*

²⁹ *Id.* at 81765

³⁰ THE WHITE HOUSE, UNITED STATES SPACE PRIORITIES FRAMEWORK (December 2021), at 5.

commonly understood as a matter of *deregulation*. For example, the National Space Policy’s cross-sector guideline says to “support innovative entrepreneurial space companies through appropriate deregulatory actions.”³¹ Similarly, an NSP commercial sector guideline directs agencies to “create transparent regulatory processes that minimize ... the regulatory burden.”³² These policies guard against excessive regulation that can stifle industry.

Consequently, the most prominent component of the rule of three exists in an inherent tension with the other two components. Deregulation may be necessary to encourage industry growth, but the goals of satisfying international obligations and preserving national security often require more regulation, not less. As the case studies in Part III demonstrate, a hallmark of sound regulatory measures is the ability to strike a balance among these divergent interests.

B. Satisfy International Obligations

The second of the three policy goals is the goal of satisfying the international obligations of the United States. Regulatory environments must satisfy the international obligation found in Article VI of the 1967 Outer Space Treaty, which says “[t]he activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”³³

Accordingly, when policy language refers to “authorization and supervision,” it directly invokes Article VI. For example, the 2021 Space Priorities Framework states: “U.S. regulations must provide clarity and certainty for the *authorization and continuing supervision* of non-governmental space activities, including for novel activities such as on-orbit servicing, orbital debris removal, space-based manufacturing, commercial human spaceflight, and recovery and use of space resources.”³⁴ The U.S. representative at a recent meeting of the legal subcommittee of the United Nations Committee on the Peaceful Use of Outer Space (COPUOS) reiterated this commitment in a statement. It read:

The United States supports a timely and responsive regulatory environment. U.S. regulations must provide clarity and certainty for the authorization and continuing supervision of non-governmental space activities, including for novel activities. We continue to focus on efforts to ensure U.S national activities are conducted in accordance with international law.³⁵

The international obligation to authorize and supervise is also frequently invoked in policies and proposals addressing Mission Authorization. For example, as previously noted, the National Space Policy calls upon the Secretary of Commerce to “identify whether any planned activities fall beyond the scope of existing authorization and supervision processes necessary to meet international obligations.” As Michael Sinclair observes, “[t]his specific tasking to the Secretary of Commerce is important because the (Outer Space Treaty) puts the United States government on the hook for many of the activities of U.S. commercial space.”³⁶

Article VI makes mandatory authorization and continuing supervision but does not prescribe how it must be accomplished.³⁷ The United States uses licenses. For space operations not covered by existing licensing

³¹ 2020 NSP, *supra* note 1, at 81757.

³² *Id.* at 81766.

³³ Outer Space Treaty, *supra* note 1, at art. VI.

³⁴ UNITED STATES SPACE PRIORITIES FRAMEWORK, *supra* note 30, at 5 (emphasis added).

³⁵ Emily Pearce, U.S. Head of Delegation, Statement at the 61st Session of the COPUOS Legal Subcommittee – Agenda Item 8: National Legislation Relevant to the Peaceful Exploration and Use of Outer Space (April 5, 2022), <https://vienna.usmission.gov/2022-copuos-lsc-u-s-ernational-legislation-relevant-to-the-peaceful-exploration-and-use-of-outer-space/>.

³⁶ Michael Sinclair, Brookings, What You May Have Missed in the New National Space Policy (Dec. 14, 2020), <https://www.brookings.edu/blog/order-from-chaos/2020/12/14/what-you-may-have-missed-in-the-new-national-space-policy/>.

³⁷ See Paul S. Dempsey, *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, 36 NW. J. INT’L. L. & BUS. 1, 14 (2016) (“The obligation of States to authorize space activities and

mechanisms, a Mission Authorization mechanism may fill the gap, as described above. The 2016 OSTP report summarized this gap-filling approach. It recognized that the United States “utilizes license conditions to implement its international obligations” but that existing licensing frameworks “do not, by themselves, provide the United States with a straightforward means to fulfill its treaty obligation” with regard to “newly contemplated commercial space activities.”³⁸ Hence, the report explained, a Mission Authorization framework could help to satisfy the international obligation that would otherwise go unmet.

Adherence to the international obligation to authorize and supervise is important for several reasons. One reason is the international law of State responsibility.³⁹ Article VI places international responsibility for “national activities in outer space,” which include the activities of non-governmental entities, on all States Parties, then goes on to require the “appropriate State” to provide “authorization and continuing supervision.”⁴⁰ In short, “States bear international responsibility for any activity in outer space, irrespective of whether it is carried out by governmental agencies or non-governmental entities.”⁴¹ If a commercial space actor were to violate an international legal obligation, it would be as if the State itself committed the violation. The State could then be on the hook for the legal consequences of a breach, such as restitution, compensation, or satisfaction.⁴²

A second reason is liability. If a commercial space object causes damage to another space object, then it is the launching State(s) – and not necessarily the commercial company – that may be held liable under the 1967 Outer Space Treaty and the 1975 Liability Convention.⁴³ This gives States a strong incentive to authorize and supervise their commercial space operators to mitigate against potential liability.

If neither of the first two reasons for adding a layer of bureaucracy seems compelling, there is a third reason: authorization and supervision of space activities is simply required. States have discretion in how they fulfill the obligation, but the obligation to authorize and continually supervise commercial space activities is not discretionary. On rare occasions, commentators may attempt to articulate a legal basis for minimizing or dismissing this obligation. For example, in a Congressional hearing in 2017 an expert offered several arguments: Article VI is essentially discretionary because it only applies to the space activities of your choice; Article VI imposes no domestic legal requirement because it is not a self-executing treaty provision; and Article VI applies only to States and not to commercial actors.⁴⁴ None of these arguments stands up to legal scrutiny.⁴⁵ As a matter of treaty interpretation, anything commonly understood to fall under the ordinary meaning of “space activities” falls under the ambit of Article VI.⁴⁶ Such activities include the operation and control of a satellite, probe, platform, or space

provide for continued supervision generally requires the establishment of a licensing and regulatory regime under domestic law, along with a system of enforcement. However, neither the Outer Space Treaty nor any of the other space conventions identify the contours of any particular licensing regime.”).

³⁸ OSTP Report, *supra* note 17, at 3.

³⁹ Int’l Law Comm’n, Rep. on the Work of Its Fifty-Third Session, Ch. 4, 32 U.N. Doc. A/56/10 (2001) [hereinafter Draft Articles on State Responsibility].

⁴⁰ Outer Space Treaty, *supra* note 1, at art. VI (“States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.”).

⁴¹ MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW MAKING, 113-14 (2010).

⁴² Draft Articles on State Responsibility, *supra* note 39, at Ch. II, Reparation for Injury.

⁴³ Outer Space Treaty, *supra* note 1, at art. VII; Convention on International Liability for Damage Caused by Space Objects, opened for signature Mar. 29, 1972, 24 U.S.T. 2389, T.I.A.S. 7762, 961 U.N.T.S. 187, 10 I.L.M. 965, G.A. Res. 2777 (XXVI) (entered into force Sept. 1, 1972).

⁴⁴ Regulating Space: Innovation, Liberty, and International Obligations: Hearing Before the H. Committee on Science, Space, and Technology, Subcommittee on Space (March 8, 2017), <http://docs.house.gov/meetings/SY/SY16/20170308/105659/HHRG-115-SY16-Wstate-MontgomeryL-20170308.pdf> (written testimony of Laura Montgomery).

⁴⁵ See John S. Goehring, *Properly Speaking, the United States Does Have an International Obligation to Authorize and Supervise Commercial Space Activity*, 78 AF. L. REV. 101 (2018) (refuting the expert testimony).

⁴⁶ Vienna Convention on the Law of Treaties, art. 31, May 23 1969, 1155 U.N.T.S. (“A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.”).

station; the use or application of such objects, the launching of a space object, manufacture of materials in space; and the exploitation of resources in space.⁴⁷

Finally, embracing Article VI obligations rather than dismissing them is also important for the long-term sustainability of space activities, in which the United States has a strong national security interest. As this author has written,

The corollary to reduced government oversight of commercial space activities is reduced accountability for commercial space activities generally. While the former may be beneficial to U.S. commercial space activities in the short-term, the latter would be detrimental to U.S. national security interests in the long-term.⁴⁸

The United States must demonstrate global leadership in compliance with international obligations because these obligations ensure accountability, and accountability by all space actors is an essential component of responsible space behavior.

C. Preserve National Security

The third policy objective is preserving national security. The need to preserve national security is reflected in multiple policies. Space Policy Directive-2, for instance, declared that commercial space regulations should promote economic growth, *protect national security*, and encourage American leadership in space commerce.⁴⁹

The National Space Policy also reinforces preserving national security as a core policy objective. In its commercial sector guidelines, it declares agencies shall “[c]reate transparent regulatory processes that minimize, *consistent with national security* and public safety, the regulatory burden and uncertainty for commercial space activities.”⁵⁰ Similarly, the Mission Authorization provision of the National Space Policy directs the Secretary of Commerce to: “[l]ead, if necessary, the development of minimally burdensome, responsive, transparent, and adaptive review, authorization, and supervision processes for such activities, *consistent with national security* and public safety interests.”⁵¹

Preserving national security generally requires the ability to impose constraints, as and when appropriate, to address national security concerns. This is the model established under NOAA’s rules for licensing private remote sensing systems. As further discussed in section III.A, remote sensing licenses may impose certain constraints depending on the capability of the system because capability corresponds with risk. Another model is the export control system aimed at “prevent(ing) the spread of sensitive technologies to foreign actors that could threaten U.S. interests.”⁵²

III. Case Studies

The rule of three provides a framework by which to evaluate commercial space regulatory environments. An ideal environment will advance the three policy goals of encouraging industry growth, satisfying international obligations, and preserving national security. A sub-optimal environment will lack sufficient means to achieve one or more of these goals. To demonstrate, this section analyses the regulatory environments applicable to commercial remote sensing and commercial RF collection.

⁴⁷ See *supra* note 45. at 109-110, citing Michael Gerhard, *Article VI of the Outer Space Treaty*, in COLOGNE COMMENTARY ON SPACE LAW, VOL. I, OUTER SPACE TREATY 103, 109 (Stephan Hobe et al., eds., 2009).

⁴⁸ *Id.* at 123.

⁴⁹ SPD-2, *supra* note 1, at 24901 (emphasis added).

⁵⁰ 2020 NSP, *supra* note 1, at 81766 (emphasis added).

⁵¹ *Id.* (emphasis added).

⁵² DEPARTMENT OF COMMERCE AND FEDERAL AVIATION ADMINISTRATION, INTRODUCTION TO U.S. EXPORT CONTROLS FOR THE COMMERCIAL SPACE INDUSTRY SEC. 1.1.2, (2017), <https://www.space.commerce.gov/wp-content/uploads/2017-export-controls-guidebook.pdf>.

A. Commercial Remote Sensing

The commercial remote sensing regulatory environment demonstrates what adherence to the rule of three looks like in practice. Recently updated federal regulations balance the goals of encouraging industry growth, satisfying international obligations, and preserving national security.

In 2018, Space Policy Directive-2 set forth the policy objectives of promoting economic growth, protecting national security, and encouraging American leadership in space commerce.⁵³ The Directive further directed the Secretary of Commerce to review the regulation implementing the Land Remote Sensing Policy Act for consistency with these policy goals and to update the remote sensing regulations as appropriate and in coordination with the Secretary of Defense and the Secretary of State, among others.⁵⁴ The remote sensing rules that were then in place, written back in 2006, were perceived to place an undue regulatory burden on licensed operators. The goal of preserving national security was being pursued at the expense of encouraging industry growth, as well as the overall competitiveness of U.S. companies.

A collaborative administrative rule-making process culminated in new rules in 2020 designed to satisfy these objectives.⁵⁵ In developing the rules, the Commerce Department's aim was "to increase transparency and certainty, and to reduce regulatory burdens, without impairing essential governmental interests in preserving U.S. national security, protecting foreign policy interests, and adhering to international obligations."⁵⁶

The new rules are intended to address the reality that much has changed in the commercial remote sensing industry since the previous regulations were implemented. In explaining the new rules, the Commerce Department observed, "[m]any national security conditions placed on U.S. remote sensing operations have become or will become ineffective due to uncontrollable foreign competition, and may have in fact encouraged such foreign competition."⁵⁷ In other words, conditions placed on U.S. operators served only to hinder their ability to compete with comparable foreign-based operators that weren't saddled with the same restrictions. Moreover, the benefit to national security was negligible if foreign-based operators could expose the same vulnerabilities that licensing conditions were intended to protect.

The new rules take a different approach. Rather than categorize license applications based on the amount of risk they pose to national security, they categorize applicants based on the degree to which they offer capabilities that are already available.⁵⁸ In addition, the new rules make a philosophical change that results in less stringency overall. Instead of license conditions being permanent, most are now temporary.⁵⁹ As a result, the burden of protecting national security has shifted from the operators to the government. "This move to temporary license conditions for novel technologies," the Commerce Department explained, "would shift the burden."⁶⁰ Whereas the old regulations "place(d) burdens of protecting national security and international obligations on private remote sensing systems through extensive and permanent licensing conditions," the new rules' temporary conditions "are designed to allow the U.S. Government time to adapt its operations to the novel technology where possible."⁶¹ In other words, "the U.S. Government will shift more of the burden of protecting national security to itself, focusing on mitigating the risk posed by the global remote sensing industry."⁶²

To execute this new approach, the rules revised the standard conditions applicable to all licensees and created categories, or tiers, for determining whether additional conditions would also be imposed. The standard licensing

⁵³ SPD-2, *supra* note 1, at 24901.

⁵⁴ *Id.*

⁵⁵ Licensing of Private Remote Sensing Space Systems, *supra* note 11.

⁵⁶ *Id.* at 30790.

⁵⁷ *Id.* at 30792.

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.* at 30791.

⁶¹ *Id.*

⁶² *Id.* at 30794.

conditions apply to all licenses regardless of tier and consist primarily of the conditions required by law.⁶³ They include requirements to:

- Comply with the Land Remote Sensing Policy Act of 1992, applicable domestic obligations, and the international obligations of the U.S.;
- Operate in such a manner as to preserve the national security of the U.S. and to observe international obligations and policies;
- Upon termination of operations under the license, dispose of any satellites in a manner satisfactory to the President⁶⁴;
- Notify the Secretary of Commerce in writing within seven days of the launch and deployment of each licensed system, to include confirmation that the component matches the orbital parameters described in the license; disposal of an on-orbit component of the system; the detection of an anomaly; and the licensee's financial insolvency or dissolution;
- Request and receive approval for a license modification before taking any action that would change a material fact of the license;
- Certify each year that all material facts in the license remain accurate;
- Cooperate with compliance, monitoring, and enforcement authorities and permit the Secretary access to ensure compliance; and
- Refrain from disseminating unenhanced data, or processed data or products derived from the licensee's system, of the State of Israel at a resolution finer than that most recently specified in the Federal Register.

If remote sensing operators offer an uncommon capability, then they are subject to more stringent conditions. Tier I licenses are for systems with a capability to collect unenhanced data that is substantially the same as unenhanced data already available from unlicensed systems, such as foreign systems.⁶⁵ Tier 1 licenses are subject to standard licensing conditions only, and are not subject to what is colloquially known as "shutter control" – the government's ability to direct limited operations.⁶⁶ Any additional restrictions would be counterproductive for Tier 1 systems because the same unenhanced data is available from a foreign competitor.

Tier 2 licenses are for systems that collect unenhanced data substantially similar to unenhanced data also available from another licensed system, but not from a foreign system. Tier 2 systems are subject to additional license restrictions, including shutter control, because "as there is no foreign competition ..., a U.S. license restriction *could* be effective."⁶⁷ If a system can collect unenhanced data unlike anything available anywhere else, foreign or domestic, then "more stringent controls logically may be applied."⁶⁸ These Tier 3 systems are subject to the same conditions applicable to Tiers 1 and 2 as well as additional licensing restrictions carefully designed to mitigate any security risks. These conditions are temporary, lasting for only one year with the potential to be renewed for a second year while the government takes steps to mitigate the risks.

B. Commercial RF

The regulatory environment of the nascent commercial RF industry does not follow the rule of three. It encourages growth through a comparatively light regulatory touch but does not provide adequate means to satisfy

⁶³ *Id.* at 30808; 15. C.F.R. 960.8.

⁶⁴ The disposition manner satisfactory to the President is to follow the rules now found in the operator's FCC license. *See Mitigation of Orbital Debris in the New Space Age, supra* note 5.

⁶⁵ *Id.* at 960.6(a)(1).

⁶⁶ *Id.* at 30792.

⁶⁷ 30792 (emphasis original).

⁶⁸ *Id.*

international obligations or to preserve national security. When measured against these three policy objectives, the regulatory environment is lacking.

Space-based commercial RF systems “are designed to detect and geolocate a range of RF signals from emitters of interest.”⁶⁹ These systems are comprised of a constellation of small satellites in Low Earth Orbit (LEO), each carrying a radio antenna capable of picking up particular radio frequencies emitted anywhere on or about Earth. The detected signals can be geolocated, meaning that their precise location can be identified and depicted on a map, and they “can also be processed and analyzed to produce useful information about spectrum use in a particular region or about the emitters themselves.”⁷⁰ In short, commercial RF systems can reveal the nature and location of human activities on Earth.

The commercial RF industry in the United States is small but growing. At the vanguard is Hawkeye 360, a company based in Herndon, Virginia. Hawkeye 360 currently has 15 satellites in orbit, with more launches planned.⁷¹ Once the planned satellite constellation is fully operational, it will detect RF emissions with a 15-minute revisit rate “in order to support timely defense, national security, and commercial applications.”⁷² Hawkeye 360 has won contracts with the National Reconnaissance Office and the National Geospatial-Intelligence Agency.⁷³

Commercial RF has applications ranging from security and defense to regulatory enforcement to emergency response. The military value of commercial RF capabilities is currently on display in Ukraine. Hawkeye 360 detected GPS jamming in and around Ukraine prior to the Russian invasion in February 2022, providing an indication of impending military activity.⁷⁴ “Those emitters jamming GPS and radars—those are leading indicators of where Russian forces are and where they’re moving.”⁷⁵

Commercial RF operators in the United States operate “without a license requirement except for what is necessary to launch and to receive a spectrum allocation to communicate with the spacecraft.”⁷⁶ In other words, operators need an FAA license to launch their payload and an FCC license to use an allocated frequency for communications, but other aspects of on-orbit operations are not regulated by license. What is collected and how it is collected is not subject to oversight.

Commercial RF operators do not require a remote sensing license from NOAA because RF collection does not meet the statutory or regulatory definition of remote sensing.⁷⁷ The statutory definition is “the collection of data which can be processed into imagery of surface features of the Earth.”⁷⁸ Implementing regulations as of 2016 (when NOAA assessed Hawkeye 360 did not need a remote sensing license) defined remote sensing space systems as “any

⁶⁹ James Vedda & Joseph Koller, *Commercial Radio Frequency (RF) Collections from Space*, Aerospace Corporation 1 (2020), <https://csp.aerospace.org/papers/commercial-radio-frequency-rf-collections-space>.

⁷⁰ *Id.* It may be possible not only to identify the geolocation of the emitted signals, but also the content. However, it is important to note that the “stated aim (of emerging commercial operators) is not to intercept and examine the content of message traffic.” *Id.*

⁷¹ Hawkeye 360, Press Release, *Hawkeye 360 Launches Next-Generation Cluster 5 Satellites* (May 24, 2022), <https://www.he360.com/hawkeye-360-launches-next-generation-cluster-5-satellites/>.

⁷² *Id.*

⁷³ See Theresa Hitchens, *After Success in Ukraine, NRO to Pitch Satellite Firms on Radio Frequency Geolocation*, BREAKING DEFENSE (April 16, 2022), <https://breakingdefense.com/2022/04/after-success-in-ukraine-nro-to-pitch-satellite-firms-on-radio-frequency-geolocation/>; Hawkeye 360, Press Release, *National Geospatial-Intelligence Agency Awards Hawkeye 360 RF Mapping Contract* (September 27, 2021), <https://www.he360.com/national-geospatial-intelligence-agency-awards-hawkeye-360-rf-mapping-contract/>.

⁷⁴ Debra Werner, *Hawkeye 360 Detects GPS Interference in Ukraine*, SPACENEWS (March 4, 2022), <https://spacenews.com/hawkeye-360-gps-ukr/>.

⁷⁵ Shaila Wunderlich, *Tuned in and Turned Up*, TRAJECTORY (April 25, 2022) <https://trajectorymagazine.com/tuned-in-and-turned-up/> (quoting Kari Bingen, Chief Strategy Officer of Hawkeye 360).

⁷⁶ JOSEF KOLLER ET AL., EMERGING ISSUES IN NEW SPACE SERVICES: TECHNOLOGY, LAW, AND REGULATORY OVERSIGHT; AEROSPACE 4 (2020).

⁷⁷ Correspondence from NOAA to Hawkeye 360 (Feb. 23, 2016), <https://fcc.report/ELS/HawKeye-360-Inc/0024-EX-CN-2017/186548.pdf> (NOAA’s Commercial Remote Sensing Regulatory Affairs (CRSA) tells Hawkeye 360, “We have assessed that your proposed mission will not be required to apply for a NOAA operator’s license.”).

⁷⁸ Land Remote Sensing Policy Act of 1992, *supra* note 7, at § 60101(4).

device, instrument, or combination thereof, (and) the space-borne platform upon which it is carried ... capable of actively or passively sensing the Earth's surface, including bodies of water, from space by making use of the properties of electromagnetic waves emitted, reflected, or diffracted by the sensed object."⁷⁹ The new implementing regulations now define remote sensing as "the collection of unenhanced data by an instrument in orbit of the Earth which can be processed into imagery of surface features of the Earth."⁸⁰ These definitions emphasize that remote sensing entails either sensing of the Earth's surface, or the ability to be processed into imagery, or both. These criteria don't apply to RF collection. RF emissions can be visually depicted on a map but cannot themselves be processed into imagery. In short, the definition of remote sensing is too narrow to include commercial RF. Consequently, U.S. companies like Hawkeye 360, Kleos, and Spire operate satellites without the need for a NOAA license.

The current regulatory environment for commercial RF has a light touch, especially in comparison to commercial remote sensing. The comparative lack of stifling regulation for commercial RF advances the first component of the rule of three by encouraging industry growth.

The same light touch that encourages industry growth means the second component – satisfying international obligations – is not accounted for. Put simply, the lack of a licensing mechanism analogous to NOAA remote sensing licenses impedes the ability of the United States to authorize and supervise commercial RF activities in space.

Mission Authorization, if such a mechanism were put in place, could provide an immediate means to account for the missing second component. Indeed, this is expressly one of the reasons Mission Authorization is deemed desirable by both the NSP and the Biden Administration's Space Priorities Framework – to provide a means to satisfy the international obligation to authorize and continually supervise commercial space activities when no other means is in place. In lieu of some new regulatory measures, however, the current commercial RF regulatory environment does not satisfy the stated policy objective of satisfying international obligations.

Some may disagree. It might be argued that the scope of the international obligation under Article VI to authorize and continually supervise space activities does not extend to commercial RF, or that FCC licenses already satisfy the obligation (even though this is not the case when it comes to commercial remote sensing). Any such argument would enrich the public discourse while facing the tough burden of explaining why international law would treat RF and remote sensing differently.

The third component, preserving national security, is not especially robust when it comes to the commercial RF regulatory environment. Commercial RF and remote sensing are inherently similar in that they both reveal the nature and location of human activities around the globe. This ability to reveal activities poses security risks because it can expose vulnerabilities. When U.S. remote sensing operators pose this risk, the government has at its disposal a carefully designed mitigation tool. By contrast, when U.S. commercial RF operators pose this risk – admittedly, the risk is smaller because, as of now, there are relatively few operators – the government lacks a comparable mitigation tool.

In lieu of the ability to mitigate security risks through licensing, some security concerns might be addressed using export controls instead. "[E]xport controls can serve as a 'back door' means of regulating commercial space activities," write Todd Harrison and Matthew Strohmeyer in a report by the Center for Strategic and International Studies.⁸¹ However, export controls are useful only for regulating the sale of data to foreign parties. They do not regulate other aspects of space operations. In the case of remote sensing, export controls are complimentary to, but not a substitute for, the various security mitigation measures made possible through NOAA licenses. By contrast, export controls are virtually the only security mitigation tool available for commercial RF.

The rule of three reveals the inadequacies of the commercial RF regulatory environment. The relative lack of regulation is a virtue when it comes to encouraging industry growth. This virtue tends to overshadow any shortcomings, yet the utility of the rule of three is that it encourages a holistic view. It juxtaposes the favorable

⁷⁹ Licensing of Private Land Remote-Sensing Space Systems, 71 Fed. Reg. 24473 (2006) at 24483.

⁸⁰ Licensing of Private Remote Sensing Systems, *supra* note 11, at § 960.4.

⁸¹ TODD HARRISON & MATTHEW STROHMEYER, COMMERCIAL SPACE REMOTE SENSING AND ITS ROLE IN NATIONAL SECURITY, CENTER FOR STRATEGIC & INTERNATIONAL STUDIES 7 (2022), <https://www.csis.org/analysis/commercial-space-remote-sensing-and-its-role-national-security>.

environment for growth against the lack of mechanisms to satisfy international obligations or to address security risks, thereby casting the regulatory environment in a new and less-flattering light.

Conclusion

Derived from multiple space policies and applicable international law, the rule of three serves as a model for how to shape commercial space regulatory environments. The ideal environment will strive for and attain three goals: encourage industry growth, satisfy international obligations, and preserve national security. The case studies of commercial remote sensing and commercial RF exhibit what a regulatory environment looks like when the rule of three is applied – or not applied – in practice. Policy makers may draw three lessons from these case studies.

First, balance is the key. The rule of three calls for each component to be present, but not necessarily in equal measure. The recently revised remote sensing rules demonstrate how a deliberative interagency and inter-sector process can achieve a balance among diverging interests. The prior regulations were deficient not because a component was wholly absent, but because the components had fallen out of balance. Similarly, Commercial RF does not necessarily need a comprehensive licensing regime analogous to remote sensing to achieve a balance among the diverging policy goals. A simple mechanism like Mission Authorization would probably suffice.

Second, strive for dynamism. The more dynamic and adaptable a regulatory environment is, the better it can satisfy the rule of three. For example, remote sensing licenses may impose additional conditions on Tier 3 systems, but these conditions are temporary and place the burden on the government to adapt to the security risk. In addition, assigned tiers can change over time as foreign benchmarks grow more capable; Tier 3 licenses could become Tier 2 and Tier 1 as the global market grows. This dynamism prevents the components of the rule of three from falling out of balance. Commercial RF, by contrast, demonstrates the problem with the absence of dynamic mechanisms. The industry is small now, but as it grows the security risks it poses will become increasingly comparable to remote sensing. Without an adequate regulatory mechanism in place, it has no ability to adapt to these changes.

Third, embrace a holistic perspective. The rule of three encourages a holistic view that reveals which interests are overrepresented and which interests are underrepresented in any given regulatory environment. The new remote sensing licensing rules were developed in an administrative rulemaking process where divergent interests could advocate for representation. By contrast, the unbalanced priorities evident in the commercial RF regulatory environment suggests that industry has an outsized influence. To recalibrate, policy makers can seek opportunities to emphasize that the individual policy goals of encouraging industry growth, satisfying international obligations, and preserving national security must be viewed collectively as a package deal.