> procedures that a regime would constitute, following establishment of the regime.[60]

This is the authoritative interpretation of the provision, as the committee which drafted the Agreement adopted it by consensus, pursuant to Article 31 of the Law of Treaties, paragraph 2(a), which provides that, after first interpreting the text of a treaty "in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context... the context for the purpose of the interpretation of a treaty shall comprise... any agreement relating to the treaty which was made between all the parties in connection with the conclusion of the treaty." Although it certainly could have been written more clearly, the Moon Agreement contains the strongest provision in international law regarding resource property rights in outer space.

As an *argumentum a contrario,* if Article 11, paragraph 3 represented a radical departure from the "national appropriation" principle in Resolution 1721 (XVI), Resolution 1962 (XVIII), or the Outer Space Treaty, one would expect to discover evidence of a vigorous controversy regarding this issue in the *travaux préparatoires* of the Moon Agreement. Is there such evidence? If so, the burden is on those who oppose resource property rights in outer space to submit their facts to a candid world. If not, once again, we must conclude that the "national appropriation" principle was never meant to apply to natural resources removed from their place.

On the last day of the 1979 COPUOS session, 3 July, after consensus was reached on the Moon Agreement, Hosenball stated:

> We note also with satisfaction that Article Xl, paragraph 8, by referring to Article VI, paragraph 2, makes it clear that the right to collect samples of natural resources is not infringed upon and that there is no limit upon the right of States parties to utilize, in the course of scientific investigations, such quantities of those natural resources found on celestial bodies as are appropriate for the support of their missions. We believe that this, in combination with the experimental and pilot programmes, will foster and further, and perhaps speed up, the

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60 UNCOPUOS, 123d mtg., U.N. Doc. A/AC.105/PV.123, at 6 (June 28, 1973).

> possibility of the commercial or practical exploitation of natural resources.[61]

No infringement, no limit. Nor does the term "scientific investigations" exclude such investigations conducted by private entities; indeed, most scientific investigations are conducted by private entities. Far from agreeing to a supposed prohibition of commercial exploitation, the U.S. looked forward to accelerating that advent.

X. CONCLUSION

H.R. 2262 does not violate international law in any way. It is not in conflict with either Resolution 1721 (XVI), Resolution 1962 (XVIII), or the Outer Space Treaty, since none of these instruments address specifically the extraction of natural resources, and indeed COPUOS deliberately excluded the legal problems of the extraction of natural resources from its deliberations on these instruments. The "Committee Views" regarding the meaning of the term "national appropriation" are consistent with the meaning that COPUOS gave to the term in Resolution 1721 (XVI), Resolution 1962 (XVIII), and the Outer Space Treaty at the time that it concluded its work on these instruments. The act is not in conflict with customary international law, which has its roots in the appropriation of lunar material by the United States and the Soviet Union, without the objection of any state, during the late 1960s and early 1970s, provided that the term "space resource obtained" has the same meaning as a space resource removed from its natural place. Although the United States is not party to the Moon Agreement, nor is the agreement binding on the United States, nevertheless the act is consistent with Article 11, paragraph 3 of the Agreement, again with the proviso that the term "space resource obtained" has the same meaning as a space resource removed from its natural place. There is nothing "dangerous" about it, as Oduntan has written with apparent alarm.[62]

The Canadian Broadcasting Corporation reported:

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[61] UNCOPUOS, 203 mtg., *supra* note 11.

[62] Oduntan, *supra* note 3.

> "My view is that natural resources [in space] should not be allowed to be appropriated by anyone—states, private companies, or international organizations," said Ram Jakhu, a professor at McGill University's institute of air and space law. [63]

Jakhu's statement merely expresses his preference of a *lex ferenda;* it is not a pronouncement of the *lex lata.*

[63] *US Space Mining Law*, *supra* note 2.

NEW SPACE ACTIVITIES EXPOSE A POTENTIAL LEGAL VACUUM

Susan J. Trepczynski[*]

The international legal regime governing space activities was created at a time when those activities were almost exclusively conducted by government actors. Consequently, the domestic laws implementing international obligations reflected the fact that space was largely a government dominated domain. However, with commercial entities becoming increasingly involved in, and vital to, space activities, it has become necessary for domestic law to evolve to ensure that private and commercial space activities are properly authorized and regulated, both for domestic policy purposes and to ensure such activities remain compliant with our international obligations. While the domestic legal regime is quite well-developed with respect to some established commercial activities, the current proliferation of commercial capabilities and proposed activities has exposed potential holes in the existing regime.

I. INTERNATIONAL LAW

The United States (U.S.) is a party to the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies* (Outer Space Treaty), [1] which makes States responsible not only for their own activities in space (i.e., governmental activities), but also for the activities of their nationals. The Outer Space Treaty also contains provisions on liability and jurisdiction and control that carry

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1 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

significant implications for States with respect to the space activities of their nationals.[2]

Pursuant to the Outer Space Treaty, States have broad and enduring obligations related to the space activities of their nationals. Article VI establishes that States "bear international responsibility for national activities in outer space . . . whether such activities are carried on by governmental agencies or non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions of" the Outer Space Treaty. Significantly, there is no narrowing of the term "activities," leaving States essentially responsible for all activities of their nationals in space.

Because States may be held legally responsible for the activities of their nationals, States should have an inherent interest in overseeing and regulating the space activities of their nationals. However, the Outer Space Treaty does not stop at simply placing that implied duty upon States; Article VI goes further by affirmatively requiring States to provide "authorization and continuing supervision" for the space activities of their nationals. While the Outer Space Treaty does not elaborate on the specific requirements for authorization and continuing supervision, certain minimum requirements can be inferred from the language. As a starting point, "authorization" implies there is a requirement for some type of an initial authorization (such as a license) to undertake an activity, but the initial authorization is only the beginning of a State's responsibility. In order to comply with Article VI obligations, States must also establish a means of continually supervising the activity, for as long as the activity persists. In the case of many space activities, this may require State supervision of ongoing activities for multiple years.

Other provisions of the Outer Space Treaty also contain significant legal implications for States involved in space activities. Article VII provides that the "launching State" is internationally liable for damage caused by its space object (or its component parts) to another State or its nationals.[3] Just as Article VI establishes that

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[2] *Id.* at Art. VI-VIII.

[3] Article VII defines a "launching State" as a State "that launches or procures the launching of an object into outer space" or a State "from whose territory or facility is launched." This language is echoed in the 1972 Liability Convention, which expands

States are responsible for non-governmental activities, the liability provisions make the launching State liable for damages caused by space objects belonging to its non-governmental entities.[4] Under Article VII of the Outer Space Treaty, such liability extends to damages caused on the "Earth, in air space or in outer space, including the Moon and other celestial bodies." The Liability Convention adds significant detail to the liability regime created by the Outer Space Treaty, to include establishing that launching States are strictly liable for damages occurring on the surface of the Earth or to an aircraft in flight, but are liable based on fault for damages occurring elsewhere.[5] Finally, Article VIII of the Outer Space Treaty provides that the State of registry has jurisdiction and control over space objects, their component parts, and personnel thereof, and specifically notes that ownership is not affected by the location of the space object (i.e., in outer space, on celestial bodies, or returned to Earth).[6] Because all space objects must have a State of registry, and that State has enduring jurisdiction and control over the object and its component parts, any activities in space that impact space objects are also impacting the interests of a sovereign.

As the above discussion demonstrates, the U.S. has accepted significant international legal obligations with respect to the space activities of its nationals, to include commercial entities. These obligations all must be implemented through domestic legislation.

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upon the liability framework established in the Outer Space Treaty. Convention on International Liability for Damage Caused by Space Objects art. I, *opened for signature* Mar. 29 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[4] Outer Space Treaty, *supra* note 1, Art. VII. Note that for any given launch, there can be more than one launching State and thus more than one State that can be held internationally liable. As previously mentioned, the Liability Convention expands upon the liability concept established in Article VII of the Outer Space Treaty and, with respect to multiple launching States, notes that those States are jointly and severally liable. As such, launching States may conclude agreements with and seek indemnification from each other, but the damaged State has the right to "seek the entire compensation due . . . from any or all of the launching States which are jointly and severally liable." Liability Convention, *supra* note3, Article V.

[5] Liability Convention, *supra* note3, Articles II and III.

[6] While there may be multiple launching States involved in a given launch, there can only be one State of registry. Pursuant to Article I of the Registration Convention, the State of registry must be a launching State. Convention on Registration of Objects Launched into Outer Space art I, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention]. In cases where there are multiple launching States, Article II of the Registration Convention requires that they jointly determine which of them will be the State of registry.

While legal and regulatory regimes are well-established with respect to many of the core space activities currently undertaken by commercial actors, such as communications, remote sensing, and launch, the growth of the commercial space sector (particularly its expansion into new markets and activities, and development of new technologies) is revealing that many of these new activities and technologies are potentially unregulated under the existing domestic legal regime. The potential voids in domestic legislation were recognized in the recently passed *Commercial Space Launch Competitiveness Act* (CSLCA), which directs a report identifying "appropriate authorization and supervision authorities" for "current and proposed near-term, commercial non-governmental activities conducted in space," and recommends "an authorization and supervision approach that would prioritize safety, utilize existing authorities, minimize burdens to the industry, promote the U.S. commercial space sector, and meet the United States obligations under international treaties."[7]

II. CURRENT U.S. STATUTORY AND REGULATORY AUTHORITIES FOR SPACE-RELATED ACTIVITIES

Broadly speaking, the current U.S. statutory and regulatory regime for space-related activities can be divided into two categories: (1) laws and regulations relating to payloads (including the functional activities of those payloads) and (2) laws and regulations relating to launch. The U.S. statutory and regulatory system pertaining to two types of payloads – satellite communications (SATCOM) and remote sensing – is well-developed. Commercial operations in both areas are relatively mature, and industry is accustomed to operating within the established laws and procedures, which serve to provide some certainty to operations. Similarly, the launching State focus of the space law treaties, combined with a U.S. policy geared toward the promotion of commercial space launch, has led to a comprehensive statutory and licensing regime for launch providers. While there will certainly be further refinements in these specific areas as industry continues to develop and

[7] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, §108 (space authority) (2015) [hereinafter CSLCA].

commercial space activities in these sectors continue to evolve, innovation and the expansion of commercial space into non-traditional sectors will highlight existing statutory and regulatory voids.

A. Communications

The Federal Communications Commission (FCC) has statutory and regulatory authority over communications satellites, and issues licenses for those systems.[8] In addition to implementing the U.S. obligations arising from the space treaties previously discussed, the FCC regulations also implement U.S. obligations as a member of the International Telecommunication Union (ITU), the UN treaty organization responsible for international telecommunications, including allocating global radiofrequency spectrum and geostationary orbital slots, and setting technical standards related to communications.[9] As regulations pertaining to the use of the radiofrequency spectrum were already well-established by the time commercial SATCOM services were expanding, it is not surprising that the laws and regulations for communications satellites comprehensively implement U.S. international obligations, while simultaneously serving as a means to ensure domestic legal and policy interests are met.

Stating that the FCC regulates communications satellites is useful shorthand, but it is important to note the breadth of the systems impacted by the regulations. FCC regulations cover the use or operation of any "apparatus for the transmission of energy or communications or signals by space or earth stations."[10] Consequently, a satellite may serve a number of primary purposes (i.e., its primary

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[8] FCC statutory authority is found in the *Communications Act of 1934*, as amended (47 USC § 151 *et seq.*); regulations specific to satellite communications are contained in 47 CFR Part 25, *Satellite Communications*.

[9] *See generally Space Services Department (SSD)*, ITU, http://www.itu.int/ITU-R/go/space/en (last visited 27 Jun 2016) (describing the general authorities and responsibilities of the ITU Radiocommunication Sector SSD). The U.S. is bound by ITU documents and implements many of the specific technical obligations through regulations, such as those promulgated by the FCC. Many provisions of the ITU Radio Regulations (RR) are directly incorporated into 47 CFR. For example, 47 CFR § 25.103 notes that "[t]erms with definitions including the '(RR)' designation are defined in the same way in § 2.1 of this chapter and in the Radio Regulations of the" ITU.

[10] 47 C.F.R. § 25.102(a) (2016). The definitions for "earth station" and "space station" contained in 47 C.F.R. § 25.103 mirror those found in the ITU RR.

purpose may not be SATCOM), but if it makes use of the radiofrequency spectrum, that aspect of its operation must comply with FCC regulations.[11] Because almost all satellites and other spacecraft must in some way utilize the radiofrequency spectrum, the FCC regulations impact a large portion of space objects.[12]

Not only are FCC regulations applicable to a broad range of spacecraft performing many different types of primary missions, they require both initial FCC authorization to transmit and continuing FCC oversight. The FCC has used this regulatory authority to reach beyond transmission capabilities and regulate other aspects of spacecraft operations. For example, applications for space station authorizations are required to provide specific information relating to "the design and operational strategies that will be used to mitigate orbital debris," to include post-mission disposal plans and the quantity of fuel that will be reserved for post-mission disposal maneuvers.[13] Once the FCC has granted an authorization, it is necessary to seek approval for any subsequent modifications that would affect "the parameters or terms and conditions of the station authorization," unless those modifications are otherwise excepted by the regulations.[14] Finally, FCC licenses are not indefinite (with a few exceptions, they generally have a period of 15 years),[15] but even within the period of the license, the FCC has the power to revoke the license if milestones specified in the regulations are not met.[16]

B. Remote Sensing

Statutory provisions directing the licensing of commercial remote sensing systems originated with the *Land Remote Sensing*

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[11] Note that FCC regulations apply only to non-governmental actors. In the U.S., federal government use of spectrum is regulated by the National Telecommunications and Information Administration (NTIA).

[12] Oftentimes terms such as "satellite," "spacecraft," and "space object" are used interchangeably, though the specific term used may have significance in technical and legal contexts. The FCC Satellite Communications regulations (47 C.F.R. Part 25) define "satellite system," "space system," and "spacecraft," in each instance defining the terms as they are defined in the ITU RRs.

[13] 47 C.FR. § 25.114(d)(14).

[14] 47 C.F.R. § 25.117

[15] 47 C.F.R. § 25.121

[16] 47 C.F.R. § 25.164. Because licenses are granted before systems are built, the milestones represent required progress toward operational capability.

Commercialization Act of 1984, which required that any license issued, among other things, had to "observe and implement the international obligations of the United States."[17] This provision subsequently appeared in the *Land Remote Sensing Policy Act of 1992*,[18] and was carried through into the legislation as it exists today. The current statutory provisions regarding the licensing of private remote sensing space systems are found in the *National and Commercial Space Programs Act*, which authorizes the National Oceanic and Atmospheric Administration (NOAA), through its Commercial Remote Sensing Regulatory Affairs (CRSRA) office, to issue licenses to private remote sensing operators.[19] Specifically, the CRSRA mission is to "regulate the operation of private Earth remote sensing space systems, subject to the jurisdiction or control of the United States, while preserving essential national security interests, foreign policy and international obligations."[20] Accordingly, any person subject to the jurisdiction and control of the U.S. requires a NOAA license to operate a private remote sensing system. While a NOAA license is generally valid for the operational lifetime of the system, it is not a blanket license for a system to conduct any and all future activities; the licensee must notify NOAA of certain activities, such as the intent to enter into an agreement with a foreign entity, and is under a continuing obligation to request amendments to the license if certain changes occur, both to business operations or to the technical parameters of the system.[21] NOAA may also revoke the license for various reasons, including non-compliance with the terms and conditions of the license and in cases where the operations are inconsistent with the national security, foreign policy, or international obligations of the U.S.[22]

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[17] Land Remote Sensing Commercialization Act of 1984, Pub. L. No. 98-365 (1984).

[18] Land Remote Sensing Policy Act of 1992, Pub. L. No. 102-555 (1992). The *Land Remote Sensing Policy Act of 1992* repealed the *Land Remote Sensing Commercialization Act of 1984*.

[19] National and Commercial Space Programs, 51 U.S.C. §60101, *et seq*. (2016). Subchapter III deals specifically with the licensing of private remote sensing space systems.

[20] *About Commercial Remote Sensing Regulatory Affairs,* NOAA, http://www.nesdis.noaa.gov/CRSRA/index.html (last visited June 27, 2016).

[21] 15 C.F.R. § 960.7–960.9 (2016).

[22] 15 CFR §960.9

While NOAA's statutory and regulatory authority with respect to remote sensing is comprehensive, it may be limited in one significant aspect – by definition remote sensing statutes and regulations only apply to the sensing of the Earth from space.[23] As interest in space situational awareness (SSA) data increases, there has been a growing commercial interest in filling the demand through the development of non-Earth imaging (NEI) capabilities. These NEI capabilities may be included on traditional remote sensing platforms (i.e., satellites that also have the capability and primary purpose of sensing the Earth), but also may be the primary payload on a satellite designed for the purpose of imaging other space objects. Companies moving forward with NEI-based business plans have submitted license applications for NEI activities to NOAA. The presence of NEI sensors on remote sensing satellites initially caused NOAA to deny licenses to several systems, because a "policy and procedure to assess NEI imagery has yet to be developed and agreed to by the IC [intelligence community]."[24] However, NOAA has since

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[23] 51 U.S.C. § 60101(4) defines "land remote sensing" as "the collection of data which can be processed into imagery of surface features of the Earth from an unclassified satellite or satellites . . ." While "land remote sensing" may appear to be a subset of a broader concept of "remote sensing," the language of the statute seems to clearly limit NOAA's authority to land remote sensing, in that all of NOAA's authorities with respect to remote sensing are derived from 50 U.S.C., Subtitle VI (Earth Observations), in particular the provisions that are found in Chapter 601, *Land Remote Sensing Policy*. The definition applicable to Chapter 601 is "land remote sensing," which is contained in the first section of the chapter and states that it is applicable to "this chapter." Logically, regulations promulgated pursuant to this statutory authority, would be limited by the scope of the statute.

[24] Advisory Committee on Commercial Remote Sensing (ACCRES), *Meeting Minutes (June 30, 2015)*, NOAA, http://www.nesdis.noaa.gov/CRSRA/files/accres-19th-meeting-minutes-091115.pdf (last visited 27 Jun 2016). In the meeting NOAA also noted that from February 2015 to the date of the meeting "CRSRA has not issued any licenses, particularly in the academic sector because they have a Non Earth Imaging (NEI) component." *Id.*

evidenced a willingness to take a more expansive view of its statutory and regulatory authorities,[25] and has issued licenses for NEI capabilities.[26]

Historically, the primary policy concern with respect to licensing commercial remote sensing activities was resolution, largely for national security reasons. However, with relatively high resolution imagery readily available today, commercial companies are turning their attention to providing capabilities in a variety of spectrums, and to providing real time (or near real time) access to imagery. In addition, companies are looking to diversify their product by providing not just imagery, but processed information and analytics. The policy concerns that drove the regulation of imagery are also applicable to the integration of various imagery sources, but NOAA has no authority to regulate the use third parties make of imagery, and the imagery itself may only be the raw material for a more focused product. For example, a commercial company may obtain imagery data that was properly collected pursuant to a NOAA license by another company or companies, and use a proprietary process (algorithms, etc.) to create a product that, if one company requested a license to image and/or produce the same information, may have been denied a license. In addition, multi-national corporations and foreign ground stations can further complicate regulatory issues.

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[25] 15 CFR § 960.3 defines "remote sensing space system, licensed system, or system" to mean "any device, instrument, or combination thereof, the space-borne platform upon which it is carried, and any related facilities ***capable of*** actively or passively sensing the Earth's surface, including bodies of water, from space by making use of the properties of the electromagnetic wave emitted, reflected, or diffracted by the sensed objects." (emphasis added) By focusing on the "capable of" qualifier, NOAA is able to argue that licensing NEI capabilities is within its scope of authority because such capabilities are technically "capable of" sensing the Earth (even if they will not actually be used to do so).

[26] *See, e.g.*, NOAA, *The ViviSat Satellite Servicing Mission Extension Vehicle (MEV) for Satellite Servicing*, http://www.nesdis.noaa.gov/CRSRA/files/vivisat_remote_sensing_license_public_summary_20_nov_15.pdf (last visited 27 Jun 2016) (announcing that, on 26 October 2015, NOAA granted a license to ViviSat LLC "to operate a private, commercial space-based remote sensing system of up to ten Mission Extension Vehicle (MEV) satellites to collect images of client satellites during rendezvous and docking operations"). Interestingly, while the NOAA license may resolve the on-orbit imaging question, the ViviSat MEV is also a perfect example of another emerging mission and technology set (on-orbit servicing and the associated rendezvous and proximity operations capabilities) that falls outside the boundaries of the current legal and regulatory regime.

C. Launch

The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) is authorized by statute to oversee, coordinate, and authorize commercial launch and reentry operations, as well as to encourage, facilitate, and promote commercial launch and reentry activities.[27] The FAA AST authorization and oversight both serves domestic legal and policy interests, and implements U.S. international legal obligations under the space treaties. While the FAA AST statutory authorizations are fairly comprehensive when it comes to launch and reentry activities, the authorizations are limited in scope to those specific activities and do not provide FAA AST any authority to review payloads independent of launch or reentry activities.

FAA AST is statutorily authorized to license the launch and reentry of expendable and reusable launch vehicles, and to issue operator licenses for such vehicles.[28] These statutory authorizations require FAA AST to conduct a payload compliance review as part of the licensing process, which specifically gives the FAA AST the ability to ensure that those seeking licenses or permits have obtained "all required licenses, authorizations, and permits" needed for a given payload, and to deny a launch or reentry license if such requirements have not been met.[29] However, if no such licenses, authorizations, or permits are required for a given payload, FAA AST can only prevent launch or reentry if it is determined it would "jeopardize the public health and safety, safety of property, or national security or foreign policy interest of the United States."[30] As there are presently separate statutory licensing requirements for remote sensing and communication payloads (under the purview of NOAA and the FCC, respectively), the FAA AST ensures the appropriate licenses have been obtained prior to licensing the launch of such payloads, but conducts no further payload review on payloads subject to NOAA or FCC licensing authorities.[31]

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[27] 51 U.S.C. § 50901 (2016).

[28] FAA AST is also responsible for licensing the operation of non-federal launch sites, or "spaceports." 51 U.S.C 50904(a).

[29] 51 U.S.C § 50904(b) and (c). The FAA AST has promulgated regulations pursuant to its statutory authorizations, which are found in 14 C.F.R., Chapter III.

[30] 51 U.S.C § 50904(c).

[31] 14 C.F.R § 415.53. The FAA AST payload reviews also exclude payloads owned or operated by the U.S. government.

While it is clear that the FAA AST payload review process does provide some government oversight of all payloads that are launched on vehicles subject to FAA AST licensing authority, the review process is far from comprehensive. The information requirements associated with the review process ensure that basic information is made available, but do not request the type of information that would enable an in-depth technical review of the payload or its capabilities.[32] Furthermore, in order to deny a launch or reentry license on the basis of a payload review, the FAA AST must determine that the payload would jeopardize safety, national security, or a foreign policy interest, which seems to set a fairly high bar for denial. It is also important to note that the license over which the FAA AST has ultimate authority is being granted to the launch company, not the payload owner/operator. The relationship between the launch provider and the payload owner/operator is based on a service contract, with the payload owner paying the launch provider for launch services and the contractual relationship likely terminating once the launch is complete. Consequently, the only information about the payload the launch company is able to provide in its FAA AST license application is the information that was supplied to it by the payload owner pursuant to the launch contract. Logically, such information will be limited to the minimum that is strictly necessary for launch purposes, as a payload owner/operator will generally have an interest in limiting dissemination of technical and operational details for proprietary and competitive reasons.

Finally, it is worth noting two additional points. The first is that once the launch license has been granted, FAA AST has no continuing oversight over the activities of the payload in space. If a payload were capable of maneuvering, manufacturing other space objects, the on-orbit maintenance of other space objects, or any of a number of other activities, those activities would not be subject to FAA AST oversight or control. This would also hold true in the case

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[32] The information requirements for payload review are contained in 14 C.F.R. § 415.59 and include: (1) payload name; (2) payload class; (3) physical dimensions and weight of payload; (4) payload owner and operator, if different from the person requesting the payload review; (5) orbital parameters for parking, transfer, and final orbit; (6) identification of hazardous and radioactive materials, and amounts of each; (7) intended operations during the life of the payload; and (8) delivery point in flight at which the payload will no longer be under licensee's control.

of the spacecraft – once a spacecraft is in orbit, if that spacecraft is capable of maneuver, the FAA AST has no ability to control its movements (i.e., the FAA is not authorized to provide space traffic management services).

The second point relates to the scope of the FAA AST authority, which is licensing launches and reentries that are within its jurisdictional mandate. This scope of authority significantly limits U.S. oversight of many payloads, since there is no legal requirement for non-government payloads to be launched from the U.S.[33] Consequently, if a commercial entity chooses (and is otherwise able under existing U.S. law) to use a foreign launch provider, its payload will not be subject to the FAA AST payload review. Furthermore, if the payload is not one that is otherwise required to be licensed by the FCC or NOAA, the U.S. may effectively have no ability to authorize or continually supervise the functioning or activities of that payload.

III. EMERGING ACTIVITIES AND THE LAW

While the majority of current commercial space activities still fall within the SATCOM, remote sensing, and launch categories, commercial space companies are starting to develop concepts and pursue technologies that expand upon and push beyond these 'traditional' capability areas. As noted, commercial remote sensing is moving from a business concept where imagery is the product, to one where the imagery itself is only part of the equation, which now may include proprietary analytics working in concert with imagery to provide a tailored final product to meet the demands of the consumer. In addition, commercial entities are focusing on utilizing multi-spectral imaging capabilities, improving revisit rates and factoring in latency requirements, and providing video, rather than still images. Commercial companies are looking at fielding constellations of less expensive small satellites, rather than relying on the traditional large and more costly remote sensing satellites that have been the norm until recently. Commercial remote sensing is evolving from providing a snapshot in time, to being able to provide

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[33] Note that U.S. export control laws may impact the ability of U.S. commercial companies to use foreign launch services for certain types of payloads.

change detection/pattern-of-life type capabilities. Commercial companies are also poised to offer their imaging capabilities not just for Earth observation, but for NEI, which would make information that was once almost exclusively in the hands of governments, generally available to the public.

Innovations are occurring in other space sectors as well. Commercial companies are developing habitation modules, researching the possibilities of on-orbit manufacturing, and examining the related concept of utilizing space resources to support such activities. The utilization of space resources presupposes the capability to find and extract those resources, which is another area for which commercial companies are developing business plans. Companies are pursuing on-orbit servicing technologies, looking at opportunities to not just provide the technology, but to provide services (which offers a much more robust business case than one solely dependent on sales of technology, such as satellites). There are also well-publicized ventures underway to support a space tourism industry, with several companies actively taking orders to provide paying customers with a suborbital space experience. All of these activities will contribute to increased activity in space, highlighted by an unprecedented increase in the ability (and need) for space objects to move and maneuver, which itself will lead to requirements for space traffic management.

As commercial space entities explore innovative technologies, products, and services, they are challenging and exposing the boundaries of the existing domestic legal and regulatory regimes. Significantly, these legal and regulatory challenges and voids are not just theoretical or contingent upon the successful development of conceptual technologies. Current capabilities, including new uses of existing technologies, are stretching the limits of the existing legal regime. The need to evolve the law in a way that is responsive to these technological developments and emerging business plans was recognized in the recent CSLCA.[34]

The CSLCA has several provisions directed at areas where the existing legal and regulatory framework may be lacking. In connection with a directed assessment of current and proposed near-term

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[34] CSLCA, *supra* note 7.

space activities, Section 108 mandates the identification of, and recommendations for, appropriate authorization and supervision authorities for such activities. Section 109 notes it is the sense of Congress "that an improved framework may be necessary for space traffic management" and directs an independent study of alternative frameworks. Finally, in a substantive addition to the law, the CSLCA adds the *Space Resource Exploration and Utilization Act* (SREUA) to the United States Code.[35] The SREUA provides that U.S. citizens "engaged in commercial recovery" of asteroid or space resources are entitled to the resource obtained, "including to possess, own, transport, use, and sell" the resource "in accordance with applicable law, including the international obligations of the United States."[36]

The SREUA has been welcomed by the commercial space sector (especially those with resource-based business plans), as it establishes an enforceable legal right (at least domestically) to the resources they seek to obtain and utilize. However, it is only one provision covering one aspect of a plethora potential space activities. As the CSLCA recognizes, there are open questions as to who should exercise authorization and supervision over emerging commercial space activities, what authorities are required for those activities, and even what the activities themselves are likely to look like in the near future. The need for a regime that addresses these legal and regulatory questions, and is capable of establishing an environment that supports the numerous growth vectors of commercial space, has not gone unnoticed by the executive branch or lawmakers, as is evidenced by both the Office of Science, Technology and Policy (OSTP) report filed pursuant to Section 108 of the CSLCA (OSTP Report)[37] and the April 2016 introduction of a draft comprehensive space policy bill, the *American Space Renaissance Act* (ASRA).[38]

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[35] The Space Resource Exploration and Utilization Act, 51 USC §51301-51303 [hereinafter SREUA].

[36] *Id.* at § 51303.

[37] OFFICE OF SCIENCE TECHNOLOGY AND POLICY, REPORT TO THE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION OF THE SENATE AND THE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY OF THE HOUSE OF REPRESENTATIVES (April 4, 2016) [hereinafter OSTP Report].

[38] American Space Renaissance Act, H.R. Res. 4945, 114th Congress (April 14, 2016) [hereinafter ASRA]. The sponsor of ASRA, Rep. James Bridenstine, stated he does not

The OSTP Report recognizes that the licensing frameworks currently in place for launch and reentry, remote sensing, and communications activities are not adequate to allow the U.S. to meet its international obligations under Article VI of the Outer Space Treaty with respect to emerging commercial space activities, specifically noting the existing frameworks "do not, by themselves, provide clear avenues through the United States Government can fulfill its Article VI obligations in relation to the newly contemplated commercial space activities."[39] The OSTP Report therefore recommends adopting a "Mission Authorization" framework, which is outlined in a legislative proposal contained in the Report. The legislative proposal requires all U.S. persons receive a mission authorization in order to "conduct missions in outer space" and authorizes the Secretary of Transportation "to grant authorizations for missions in space."[40] Because the aim of the Mission Authorization proposal is to "establish a process no more burdensome than necessary to enable the United States Government to authorized these pioneering space activities in conformity with its treaty obligations, and to safeguard core public interests such as national security," it is not intended to be a comprehensive regulatory framework.[41] Accordingly, agency review would only cover "a proposed mission in relation to specified government interests, with only such conditions as necessary for fulfillment of those conditions," and those activities that are already subject to a comprehensive regulatory framework are specifically exempted from the Mission Authorization legislative proposal.[42]

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expect the bill to pass intact, but to "serve as a conversation piece, as well as a repository for the best ideas that we can plug and play into different pieces of legislation." Rep. James Bridenstine, *Draft Bill Proposes Wide-Ranging Space Policy Changes*, AMERICAN SPACE RENAISSANCE ACT, http://spacerenaissanceact.com/draft-bill-proposes-wide-ranging-space-policy-changes/ (last visited June 27, 2016)

[39] OSTP Report, *supra* note 37 at 3. The OSTP Report recognizes the following three broad categories of "unprecedented commercial space activities planned by American companies": (1) private missions beyond Earth's orbit; (2) new on-orbit activities; and (3) space resource utilization. *Id*. at 2.

[40] *Id.* at 6

[41] *Id.* at 4. The Report specifically states that the "legislative proposal is not intended to authorize any agency to prescribe substantive, generally applicable regulations." *Id.*

[42] *Id*. at 6. The legislative proposal specifically exempts three classes of missions from its scope: "(i) Government activities subject to section 50919(g); (ii) Missions for which licensing by the Department of Transportation under Chapter 509 of Title 51 . . . or by the Secretary of Commerce under chapter 601 of Title 51, is sufficient to fulfill the