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The Journal of Space Safety Engineering (JSSE) provides an authoritative source of information in the field of space safety design, research and development. It serves applied scientists, engineers, policy makers and safety advocates with a platform to develop, promote and coordinate the science, technology and practice of space safety. JSSE seeks to establish channels of communication between industry, academy and government in the field of space safety and sustainability.

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NATIONAL LEGISLATION GOVERNING COMMERCIAL SPACE ACTIVITIES

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1. INTRODUCTION

Through much of the 20th century, space exploration and development was dominated by governments. Increasingly, however, private for-profit firms began investing in commercial space development. In its early years, commercial activities in outer space were dominated by satellite communications, particularly telephone and television communications. More recent commercial activities have focused on remote sensing and global positioning. The mining of asteroids and other near-Earth celestial bodies has not yet begun. Space tourism and the transportation of passengers in space are but embryonic.

Global space activity of governments and private companies grew to $314 billion in 2013.1 Private-sector commercial space activity is growing at a brisk pace, while governmental activity is declining. Between 2012-2013, commercial space products and services revenue grew 7%; commercial infrastructure and support industries grew by nearly 5%; while government spending decreased by almost 2%.2 Space investment is a major part of the infrastructure of communications – both telecommunications and broadcast – of weather and geological monitoring, and of defense.3 Thus, commercial development of outer space is outpacing governmental activities in space. As private firms launch commercial space activities, the legal obligations and liability exposure of space-faring States proliferate as well.

A growing number of States are becoming space-faring nations. Many are enacting national space legislation, establishing governmental space regulatory institutions and giving them jurisdiction to license private actors and ensure compliance with regulatory requirements. They promulgate laws regulating space activities in order to fulfill their international obligations, to protect their citizens from harm, to protect their treasuries from liability, and to encourage and foster the development of commercial space activities.5 Further, with the absence of an international regulatory regime addressing safety and navigation of aerospace vehicles, a growing number of space-faring States see the need to fill that regulatory void with domestic legislation.6 Though a number of commentators have urged the International Civil Aviation Organization [ICAO] to regulate the safety and navigation of aerospace vehicles, to date, it has declined.7 Moreover, the world community has failed to draft a single multilateral treaty addressing space issues since 1979. That abstinence too inspires the promulgation of domestic space legislation.

The U.N. General Assembly has encouraged States to “consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-governmental entities under their jurisdiction.”8 The rapid emergence of national space legislation is the fastest growing area of Space Law.

2. INTERNATIONAL OBLIGATIONS

Space Law consists of a growing number of international multilateral and bilateral agreements and conventions, U.N. resolutions, decrees by international organizations, national legislation and regulations, and court decisions.9 Five multilateral conventions, drafted in a dozen years, place numerous obligations upon States.10 They require States to adhere to principles of international law, assume responsibility and liability for activities in space (whether governmental or non-governmental), authorize and supervise the activities of their nationals in space, and notify and register their space objects.

Among requirements imposed by the Outer Space Treaty of 1967 are the following:

- States must carry on space activities in accordance with principles of international law;11
- States bear international responsibility for national activities in space and on the moon and celestial bodies, including activities of both governmental and non-governmental entities;
- States must authorize and supervise the activities of their nationals in space;12
- States that (a) launch, (b) procure the launch, or (c) from whose territory or facility an object is launched, are internationally liable for damage to another State.
or its national or juridical persons by such object in the air or in space;13
• States on whose registry an object is launched must retain jurisdiction and control over the object and any personnel thereon;14
• States must avoid harmful contamination and adverse environmental consequences from the introduction of extraterrestrial matter; if it believes an activity or experiment by it or its nationals in space would potentially harm or interfere with activities of other States in space, it must consult with such States before proceeding;15 and
• States must inform the UN Secretary General of the “nature, conduct, locations and results” of its activities in space.16

Several of these provisions also are elaborated upon by the Liability Convention of 1972.17 Building on Article VII of the Outer Space Treaty, the Liability Convention imposes liability upon a launching State (i.e., the State that launches, procures the launch, or from whose territory or facility a space object is launched)18 to pay compensation for personal injury and property damage caused by its space objects on the surface of the Earth, or to aircraft.19 The Convention establishes a two-tier liability regime,20 providing that the “launching State” is absolutely liable for damage caused by its space objects on the surface of the Earth or to an aircraft in flight,21 and liable in negligence22 for damage23 caused to a space object of another State or to persons or property on board.24 Where there is more than one launching State, they shall be jointly and severally liable for the damage they cause.25

Hence, by ratifying or acceding to either the Outer Space Treaty of 1967, or the Liability Convention of 1972, the launching or launch-procuring State becomes potentially liable for damages caused by itself and its commercial launch sector.26 A ratifying State accepts absolute liability for damage on the ground or to aircraft in flight outside its territory when a launch takes place from its territory or facilities, or when it procures a launch from another State.27 A State incurs fault-based liability for damage caused in outer space.28 In addition to these multilateral conventions, additional legal obligations are imposed upon States through customary international law,29 an array of United Nations Security Council and General Assembly Resolutions,30 and a growing body of “soft law.”31

Further, the Chicago Convention of 1944 – which established the International Civil Aviation Administration to harmonize State regulation of aircraft safety and navigation in – may apply to vehicles transporting space objects through air space.32 But to date, ICAO has promulgated no Standards and Recommended Practices governing aerospace vehicles or rockets, though in time, it may.33

3. STATE REGULATION OF SPACE ACTIVITIES

As a consequence of the aforementioned international obligations and the liability exposure created thereby, as well as a desire to protect the health and safety of their citizens, their property and the environment, a growing number of States have promulgated national legislation to regulate commercial space activities. As one source notes, “Since a government can only act on the basis of laws or respective regulations, the establishment of national space laws is the most effective way of providing the State with the means to authorize and supervise non-governmental space activities.”34 At least twenty-six States – about 14% of the members of the United Nations - regulate space activities. Among the States that have enacted national space legislation are Algeria,35 Argentina,36 Australia,37 Austria,38 Belgium,39 Brazil,40 Canada,41 Chile,42 the People’s Republic of China [PRC],43 Colombia,44 France,45 Germany,46 Italy,47 Japan,48 Kazakhstan,49 Netherlands,50 Nigeria,51 Norway,52 Russian Federation,53 South Africa,54 the Republic of Korea [South Korea],55 Spain,56 Sweden,57 Ukraine,58 United Kingdom,59 United States,60 and Venezuela.61 Hong Kong also regulates space activities.62

The United Nations Committee on the Peaceful Use of Outer Space [COPUOS] recommends that, “Space activities should require authorization by a competent national authority; the authorities and procedures, as well as the conditions for granting, modifying, suspending and revoking the authorization should be set out clearly to establish a predictable and reliable regulatory framework ...The conditions for authorization should be consistent with the international obligations and commitments of States, in particular under the United Nations treaties on outer space...”63

Governmental oversight of space activities is essential to protect public safety, property, and the environment, and to fulfill State obligations under international law. Licensing becomes the bedrock of governmental regulation of commercial space activities.

4. THE LICENSE AS A PREREQUISITE TO SPACE OPERATIONS

A growing number of States require a license as a prerequisite to space activity. Many require a permit for each individual launch of a space object, while some require separate licenses for an overseas launch or re-entry. Most
States that have enacted national Space Law legislation require a license for a launch from their territory, or by their citizens from any location. Some States also regulate launch facilities (a/k/a spaceports). Several examples follow.

Brazil regulates launches from its territory. Kazakhstan also requires a license prior to carrying out space activities. Australia imposes a requirement that an applicant procure a space license, launch permit or overseas launch certificate prior to operations. France requires a license of a French national or juridical persons headquartered in France who intend to launch or procure a launch of a space object from French territory.

In Sweden, no space activity is permitted on Swedish territory or by a Swedish person without a license. An application in writing must be submitted to the National Board for Space Activities (now the Swedish National Space Board). The license may be restricted in a manner deemed appropriate. However, the legislation does not specify the formal procedures, nor does it explain how the public interest, security, public health or environment are to be protected.

In the United Kingdom, a launch, operation of a space activity, or any activity in outer space (other than leasing a space segment satellite capacity, transponders) requires a license. Such activity may not jeopardize public health or safety of persons or property, and must be conducted in a manner consistent with international obligations. It may not impair national security.

In the United States, the Commercial Space Launch Act of 1984 [CSLA] authorized the Federal Aviation Administration [FAA] to license the launch of launch vehicles, reentry of reentry vehicles, as well as the operation of a launch or reentry site. The U.S. licenses launches for commercial space flights, without safety certifications of vehicles. A U.S. citizen must obtain FAA authorization to launch, reenter or operate a launch or reentry site anywhere in the world. Any person seeking to conduct commercial space transportation in the U.S. must also obtain FAA authorization. Such licenses are issued by the FAA’s Associate Administrator for Commercial Space Transportation [AST], who prescribes the terms and conditions for conducting authorized activity by the vehicle or site operator. Regulatory review of a launch application focuses on public health and safety, safety of property, and U.S. national security and foreign policy concerns and obligations. Unless the launch and reentry is exempt from regulation, the applicant may apply for: (1) a launch- or reentry-specific license; or (2) a launch or reentry operator license. The FAA has 180 days to process a license application. The licensing process consists of several steps:

- Pre-application consultation;
- Policy review and approval;
- Safety review and approval;
- Payload review and determination;
- Financial responsibility determination;
- Environmental review; and
- Compliance monitoring.

In the United States, the National Oceanic and Atmospheric Administration [NOAA] issues regulations for the licensing, monitoring and compliance of operators of private Earth remote sensing space systems. Similarly, Germany requires licensing of high-grade Earth remote sensing systems, and providers of such remote sensing data.

Some States impose de minimus requirements. For example, Argentina requires that those engaging in space activities register with the government.
5. TECHNICAL AND FINANCIAL QUALIFICATIONS OF APPLICANTS

Many States that license space activities evaluate the technical and financial fitness of the applicant and its facilities to ensure that they do not endanger public health, safety and property or impose economic burdens on the national treasury. These requirements are similar to the managerial and financial fitness certification requirements imposed upon airlines. Several examples follow.

Australia has promulgated an elaborate and detailed licensing statute. It requires that the launch facility, launch vehicle, and flight path be effective and safe. Applicants must submit design and engineering plans of the launch vehicle. Applicants must identify their organizational structure and financial fitness, their program management plan, their technology security plan, and their emergency plan.

Brazil requires a license to engage in commercial Space Launching Activities from Brazilian territory. The license may contain restrictive or conditioning clauses. Activities of the licensee are controlled, monitored and supervised by the Brazilian Space Agency [AEB]. Technical, economic and financial qualifications are imposed upon licensees. In Brazil, “A license will only be granted to legal persons, associated or affiliated with business or legal representation in the country, with express powers to respond administratively or judicially and considered technically and administratively qualified to perform launching activities. Granting, monitoring, and control of the permit for a commercial space launch from Brazilian territory is performed by the Brazilian Space Agency.”

In Korea, an applicant may be disqualified if he is deemed incompetent or quasi-incompetent, bankrupt, if he served a prison sentence in the prior two years, or been on probation for violating the Act. France assesses the applicant’s technical, moral, financial and professional capabilities before issuing a license.

In the Netherlands, eligibility for a license depends on the applicant’s knowledge and experience, and his authorization for the use of radio frequency. An applicant must submit detailed information identifying the space activities planned, a financial risk analysis, liability insurance, authorization of radio frequency, and the applicant’s knowledge and experience with regard to performance of space activities. An application for a license must be denied if necessary for protection of safety of persons or property, protection of the environment, protection of public order, security of the State, or fulfillment of international obligations of the State. An application may be denied if a previously issued license has been revoked, the applicant has not discharged his obligations under a license, if he fails to comply with the rules established governing space activities, or there is good reason to suspect that the applicant will not follow those rules.

In The Russian Federation, the Russian Space Agency issues licenses for space operations. To obtain a license, the applicant must submit an application indicating the applicant’s name, organizational and legal form, address, and banking information, the type of activity proposed, the duration of the license, a copy of constitutive documents, the state registration of the legal entity, tax agency certification, payment of filing fees, a license for using radio frequencies, registration of the satellite, safety of space operations and reliability of space equipment, and a State Secrecy license. A decision to grant or deny a license must be made within 30 days of receipt of the application and supporting documentation. An application may be denied for false information or misrepresentation in documents filed by the applicant, or an adverse decision by the “expert commission.” This expert evaluation is conducted by science organizations or independent experts on a contractual basis.

6. LIABILITY, INSURANCE & INDEMNIFICATION REQUIREMENTS

Professor Steven Freeland notes that the imposition of joint and several liability is among the reasons that many States have enacted national space laws to allow them to reduce their liability by imposing financial responsibility to private launching companies. Typically, statutes require that the licensee carry adequate insurance to cover death, injury or property damage, and indemnify the State should it have to pay damages. In order to promote commercial development of space, some States cap liability, in effect backing such development with the financial resources of the national treasury.

For example, in Korea, A person who launches is liable for any damages caused, and must carry sufficient insurance to cover that liability as prescribed by the Ministry of Science and Technology. The launching party must pay compensation for damage caused by launch activities, except in case of armed conflict, hostile activity, civil war or rebellion, in which case he shall only be liable for damage caused by his willful misconduct or negligence. One who procures a launch permit must insure against third party liability. However, the amount of liability is limited to 200 billion won. Austria is more generous still. In Austria, insurance requirements may be waived if the space activity is deemed to be in the public interest (i.e., if it advances the interests of science, education or research).
Australia also imposes insurance and financial requirements upon licensees. In China, a licensee must carry insurance against liability. Similarly, Hong Kong requires that the licensee insure himself against liability, and indemnify the Hong Kong and PRC governments against claims bought either.

In the Netherlands, the licensee must maintain “the maximum possible cover for the liability arising from the space activities for which a license is requested”, with account taken of what can reasonably covered by insurance. Some States, such as Kazakhstan, impose general indemnification requirements for damage caused by space activities.

7. ENVIRONMENTAL PROTECTION

Several States use the licensing process to address concerns about environmental contamination of outer space or the Earth. Austria places particular emphasis on space debris mitigation in its licensing process. It insists upon compliance with the “state of the art” and “internationally recognized guidelines for the mitigation of space debris”. Similarly, the Government of Hong Kong requires that licensees prevent contamination of outer space, and avoid interference with others in the peaceful use of space. In Belgium, environmental studies are required as a prerequisite to licensing.

8. OTHER CONDITIONS IMPOSED UPON LICENSES

Several States authorize their regulatory agencies to impose restrictions upon licenses. For example, in the Netherlands, regulations and restrictions may be imposed for the following purposes:

- the safety of persons and goods;
- protection of the environment in outer space;
- financial security;
- protection of public order;
- security of the State;
- fulfillment of the international obligations of the State.

In the Peoples Republic of China, an applicant for a license for the launch of civil space objects is required to abide by its laws, to not endanger public health or safety, to not endanger national security, damage the national interests, or violate the national diplomatic policies or the international conventions which China has ratified.

In France, restrictions on the license may be imposed to protect the safety of people and property, as well as the protection of public health and the environment. In the United Kingdom, the license may include conditions permitting inspection by the regulator. In Australia, nuclear weapons and weapons of mass destruction are prohibited, and no fissionable material may be launched without prior approval.

9. LICENSE DURATION

Most States that regulate commercial space activities require a license for each individual launch. However, several issue licenses for longer periods of time.

For example, in Australia, one may receive a launch permit or exemption certificate for launch and return, and a space license for up to 20 years. In Russia, licenses are valid for not less than three years. They are valid only for the type of space operations specified, and may not be transferred to another. In the Netherlands, a time limit may be imposed within which the licensee must begin the proposed space activities.

10. PRE-LAUNCH REQUIREMENTS

Several States impose additional obligations upon licensees prior to launch. For example, in Australia, licensees must receive approval from local ambulance, fire, and police authorities prior to launching. Environmental approvals also are required. Launches must not be conducted in a way likely to cause harm to public health or safety or damage to property.

In China, nine months prior to the scheduled launch, the applicant must submit relevant legal and technical documents to the Commission of Science, Technology, and Industry for National Defense [COSTIND], including proof that the project complies with national environmental laws and regulations, the safety design report relevant to the project and information related to public safety, supplementary information concerning the reliability of Safety Critical Systems, and the prevention from pollution and space debris.

11. OPERATIONAL RESTRICTIONS

In order to reduce the likelihood of personal, property or environmental damage, a number of States impose operational restrictions on the launch of space objects. For example:
In Australia, no launch is allowed that might create a hazard to aircraft, person or property; no launch is permitted into a prohibited area or restricted area; no launch is allowed higher than 400 feet in controlled airspace except in an approved area or in accordance with air traffic control clearance; and no launch is permitted within three nautical miles of an aerodrome. The operator must demonstrate that the launch will impose the lowest practicable risk within the bounds of reasonable cost.

In Hong Kong, no contamination of space is permitted, nor is interference with others; and the disposal of payload on termination of activities is required.

Ireland has promulgated legislation providing that a rocket may not be operated without a license. Seven days prior to launch, the Operating Standards Department of the Irish Aviation Authority must be informed of the identity of the persons responsible for the operation, the number, size and weight of each rocket, the altitude at which it will be operated, the location, date and time of the operation. In Ireland, rocket launches are prohibited if they create a potential collision hazard with an aircraft, operation in controlled space, within eight kilometers of an airport, at an altitude where horizontal visibility is less than eight kilometers, into a cloud, within 300 meters of any person or property not involved in the operation of the rocket, or at night.

12. REGISTRATION

So as to comply with their international obligations under the Registration Convention, several States require that all space objects launched by its corporate or individual citizens be registered.

Argentina, Australia, Belgium, the Peoples Republic of China, France, Japan, Kazakhstan, the Netherlands, the Republic of Korea, the Russian Federation, Spain, Sweden, Ukraine, the United Kingdom and the United States are among them.

For example Belgium created a National Register in accordance with the Registration Convention. Argentina enacted a novel provision requiring that the operator provide information on environmental precautions taken, including mechanisms for placement of the space object in a transfer orbit at the end of its useful life, the anticipated date of its recovery, disintegration or loss of contact.

13. ENFORCEMENT & SANCTIONS

To give their regulatory oversight teeth, many States impose enforcement mechanisms in their national space legislation. License suspension or revocation, as well as fines and imprisonment, are important regulatory means to ensure compliance.

Suspension & Revocation

In Australia, a licensee may have its license suspended or revoked if it contravenes a license condition, endangers national security, or violates foreign policy or international obligations. In Belgium, a license may be suspended or revoked for failure to respect the conditions imposed upon the license, or an infringement of law, of public order, or the safety of people or property by the licensee.

In China, The COSTIND may revoke the license in a serious situation if the licensee:

(a) violates the relevant national laws or regulations or the agreement between China and other states on maintaining confidentiality during execution of the project;
(b) conducts any actions endangering national security, damaging national interests or violating national diplomatic policies during execution of the project;
(c) carries out the launch activities beyond the limit approved by the license; or
(d) conducts other actions in violation of the present measures.

Also in China, the licensee may also be subject to administrative penalties if he conceals the truth, practices fraud or injures the national interest in its application or during the execution of the project.

In Korea, a license may be suspended on grounds that the licensee is incompetent, in bankruptcy or in violation of legislation, has delayed a launch for more than a year without cause, has obtained a license by false means, has caused threats to national security, or has jeopardized safety. A launch license may be revoked for delaying the launch more than a year, obtaining the license via false means, a threat to national security, safety deficiencies (e.g., "fuel leakage or defects in the communication systems"), or failing to secure license amendment for changes in the launch.

In the Netherlands, license revocation is required if requested by the license-holder, it is necessary to comply with an international obligation, or there is good reason to believe the licensee will jeopardize safety, environmental protection or the maintenance of public order and national security. The license may be revoked if the rules
of the Act or conditions imposed upon the license have been or are being violated, the space activities have not been commenced within the prescribed time period, the purpose of the space activities for which the license was issued have significantly changed, the technical or financial capabilities of the licensee has changed, the information or documents provided with the application are so incorrect or incomplete that a different decision would have been made if the facts had been known at the time of license issuance, or it is necessary to protect safety, the environment, financial security, public order, State security or fulfillment of international obligations.  

In Korea, a failure to comply with instructions or orders, the discovery of the filing of false data, the dissolution of the legal entity of the licensee, or the violation of license conditions may result in license suspension or revocation.  Such suspension or annulment may be imposed on a three day notice.  Decisions of the Russian Space Agency are subject to appeal.

South Africa may amend, suspend or revoke a license if any condition was violated, or if the operations pose an unacceptable safety risk. In Sweden, the license may be withdrawn if license conditions are disregarded. In the United Kingdom, a license may be suspended or revoked if a condition imposed thereon is not complied with, or such action is required for public health, or national security, or in order to comply with international obligations.

Fines and Imprisonment

In Korea, one who launches without a license may be sentenced to up to five years imprisonment, and face fines up to 50 million won. One who fails to comply with an interruption order may serve up to three years in prison and be fined up to 30 million won. Fines of up to 10 million won may be imposed for failure to register the space object, or failure to report changes in the launch different from the license. Fines of up to 5 million won may be imposed on the license for failure to report information different than that in the license application, one who “denies, interferes or evades investigation of an accident.” One who objects to the imposition of a fine upon him may appeal within 30 days, and the penalty will be reviewed by a court.

Japan may impose a fine not to exceed ¥200,000 for failing to file a report or filing a false report, failure to obtain required authorization or approval from the Minister of Education, Culture, Sports, Science and Technology, failure to register, conducting unauthorized activities, or launching satellites without required insurance.

In France, the administrative authority may at any time give instructions or require any measures deemed necessary to protect the safety of persons or property, or to protect the public health or the environment. Fines of up to €200,000 may be imposed for launching a space object without authorization.

In the Netherlands, administrative penalties for failure to possess a license and launch a space object or endangerment of safety or the environment may be imposed of up to €450,000, or 10% of the relevant annual sales in the Netherlands. Failure to register a space object or follow rules related thereto may result in an administrative penalty of up to €100,000. In Sweden, violations of the national Space Laws may result in imprisonment of up to one year.

14. CONCLUSION

Cognizant of their international legal obligations and liability exposure, and mindful of the need to protect life, property and the environment, at least 26 States have promulgated national space legislation and imposed regulatory requirements upon commercial space activities. Professor Stephan Hobe observes, “By virtue of Article VI of the Outer Space Treaty, states are obligated to authorize and to continuously supervise their national space activities. This obligation can best be complied with by enacting national space legislation, preferably with a licensing regime for private activities in outer space, including certification of space vehicles.” At the same time, many States are promulgating regulations to facilitate and incentivize commercial use of space, including requiring State payloads to be placed in orbit by commercial rockets, and imposing limits on liability of non-governmental organizations.

As we have seen, to enhance safety, many national space laws focus on common issues through the vehicle of licensing – the technical and financial qualifications of applicants, liability and indemnification, environmental issues, operational restrictions, sanctions and enforcement. Although a growing number of States are promulgating national Space Law legislation, and although, many such laws focus on common issues, there is little harmonization between the approaches taken to licensing and regulation. Some States (e.g., Australia and the United States) have enacted comprehensive and elaborate regulatory statutes, while others (e.g., Ireland and Norway) have promulgated rather terse laws. Many more (e.g., India and Switzerland) have yet to enact any legislation at all on the subject.
Three and a half decades have elapsed since the last international multilateral Space Law convention was drafted. Given the dearth of international regulation of aerospace safety and navigation, States would be well advised to establish regulatory institutions to oversee space activities in order to protect their environment, ensure safety, protect their citizens and persons and their territory and property from environmental damage or injury, and cover the costs of catastrophic loss when it occurs. National space laws are an important means of achieving those public policies. At minimum, States should promulgate domestic space laws establishing a regulatory agency with jurisdiction over licensing and enforcement, as well as addressing liability insurance and damage reimbursement. Further, so as to encourage commercial development of space, the regulatory burden and liability risk exposure should not be onerous. During the embryonic and developmental period of commercial space activity, liability should be capped. Moreover, States should attempt to harmonize their laws with other States, so that global uniformity might be enhanced, and flag-of-convenience type forum shopping discouraged. It would be shameful if commercial space activities were attracted to the jurisdictions with the lowest taxes, and lowest cost regulatory structure, at the expense of safety and environmental harm.

Eventually, one would hope, the growth in domestic regulation might influence development of international law, and motivate the international community to come together and establish harmonized regulatory standards, as it has done in the field of aviation safety and navigation with the promulgation of the Chicago Convention of 1944.

15. REFERENCES

[3] In its early years, commercial development of space was dominated by satellite communications, particularly telephone and television communications. More recent commercial activities have focused on satellite imaging, global positioning, and radio communications. Mining of asteroids and other near-Earth celestial bodies has not yet begun. The transportation of passengers in space is but embryonic.
[5] “In view of the growing commercial activity, legislators have sought the need to establish governmental control over commercial operators in order to ensure compliance with their international obligations and their own security and safety concerns.” European Space Policy Institute, Economic and Policy Aspects of Space Regulations in Europe, Part I 5 (Sept. 2009).
[6] Paul Fitzgerald notes, “while it is true that domestic law is probably sufficient to cover “up and down” SATV [suborbital aerospace transportation vehicle] flights, international carriage by SATV will require legal infrastructure, and such a requirement will likely be necessary within the next decade. Unless states begin to consider this issue, it is not inconceivable that such a lack of action could become an impediment to intercontinental flights by SATVs.” P. Paul Fitzgerald, Inner Space: ICAO’s New Frontier, 79 J. Air L. & Com. 3 (2014).
[9] For a dozen years commencing in 1967, the world community drafted five major multilateral conventions establishing the basic principles of Space Law:
  • The “Outer Space Treaty” of 1967; Treaty on Principles Governing the Activities of States


[12] Outer Space Treaty Art. VI. Article VI of the Outer Space Treaty imposes upon States international responsibility to provide “authorization and continuing supervision” of national activities in space, including the activities of both governmental and non-governmental entities.

[13] Outer Space Treaty Art. VII. Article VII provides that States that (a) launch, (b) procure the launch, or (c) from whose territory an object is launched, are internationally liable for damage caused to another State or its national or juridical persons by such object whether in the air or in space.

[14] Outer Space Treaty Art. VIII. See PAUL STEPHEN DEMPSEY, AVIATION LIABILITY LAW § 6.64 (Lexis Nexis 2nd ed. 2013). Article VIII of the Outer Space Treaty also requires that space objects and component parts found in a State shall be returned to the State of registry. Article VIII of the Outer Space Treaty provides that the State of registry shall retain jurisdiction and control over a space object and any personnel thereon, whether in space or on a celestial body. But it does not define the “State of registry.” The Registration Convention of 1976 provides elaboration. Convention on Registration of Objects Launched into Outer Space, opened for signature Jan. 14, 1975, 28 U.S.T. 695, T.I.A.S. 8480, 1023 U.N.T.S. 15, G.A. Res. 3235 (XXIX), entered into force on 15 September 1976. The Registration Convention defines the “State of registry” as the launching State (recall the definition above) on whose registry a space object is carried. Registration Convention Art. I. The Convention requires that every space object launched be entered in appropriate registry that the launching State shall maintain. Registration Convention Art. II. It defines the information that shall be carried on the registry. The Convention also requires that the State of registry must notify the UN Secretary General of space objects which were, but no longer are, in Earth orbit. Registration Convention Art. IV(3).


[16] Outer Space Treaty Art. XI.


[18] Liability Convention Art. I.


“The [Liability Convention] established a basic framework of tort law applicable to space activities. The Liability Convention was a response to concerns about the danger that space...
objects pose on Earth when they re-enter the atmosphere. Damage caused by space objects while they are in space, on the other hand, did not motivate the formation of the Liability Convention, which explains why terrestrial damage has a stricter liability scheme under the Liability Convention than damage that occurs in space. The Liability Convention instituted an absolute liability policy for damage on the Earth’s surface, or in airspace, caused by space objects. However, a state is only liable for damage to another state’s space objects if ‘the damage is due to [the state’s] fault or the fault of persons for whom [the state] is responsible.’ An injured party cannot recover compensation under this Convention if another entity of the same state harmed its space object. In that case, the injured party would most likely have a remedy under national tort law...”


[21] Liability Convention Art II.


[23] It is unclear whether recoverable damages include lost wages, lost profits, or non-economic damages such as pain and suffering. Punitive damages are not envisaged. See Joseph J. MacAvoy, *Nuclear Space and the Earth Environment: The Benefits, Dangers, and Legality of Nuclear Power and Propulsion in Outer Space*, 29 WM. & MARY ENVTL. L. & POL’Y REV. 191, 226 (2004).

[24] Liability Convention Art III. The Convention outlines a limited number of defenses. The launching State may be wholly exonerated from liability if it proves that the damage resulted from the “gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents”, unless the launch was not in conformity with principles of international law, including in particular, the United Nations Charter or the Outer Space Treaty.

[25] *See generally, HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS* (Martinus Nijhoff Publishers, 1989), and PAUL STEPHEN DEMPSEY, *AVIATION LIABILITY LAW § 6.65* (Lexis Nexis 2nd ed. 2013). The Liability Convention also establishes specific procedures for the settlement of damage claims, including a one year statute of limitations and, where necessary, establishment of a Claims Commission. Claims must be presented through diplomatic channels by a State on its behalf, or on behalf of its nationals.


[29] The 1978 crash of the *Cosmos 954* satellite into Canada, creating damages totaling $14 million, led Canada to file a $6 million claim with the (then) Soviet Union, of which $3 million was eventually paid. Joseph J. MacAvoy, *Nuclear Space and the Earth Environment: The Benefits, Dangers, and Legality of Nuclear Power and Propulsion in Outer Space*, 29 WM. & MARY ENVTL. L. & POL’Y REV. 191, 227 (2004). The settlement agreement declared, “The standard of absolute liability for space activities, in particular activities involving the use of nuclear energy, is considered to have become a general principle of international law.”


Several sources contend that several core concepts from the international Space Law conventions have evolved into customary international law. For example, “[T]he consensus has developed that a few principles of customary international law apply to space activities. These include the ‘essential principles of the Outer Space Treaty...’”, Peter Malanczuk, *Space Law as a Branch of International Law*, 1994 NETH. Y.B. INT’L L. 143, 159 (1995); Robert A. Ramey, *Armed Conflict on the Final Frontier: The Law of War in Space*, 48 A.F. L. REV. 1, 74 (2000). See also, ANTHONY AUST, HANDBOOK OF INTERNATIONAL LAW 339 (2nd ed. 2010) (“The [Outer Space Treaty’s] basic principles... can now be regarded as representing customary international law.”). “Despite the relative youth of space law, several core concepts have crystallized into customary interna-
General Assembly Resolutions are not binding

In 1961, the U.N. General Assembly declared


But this view is not universally shared: “It is not clear, however, that customary international law even exists. At first glance, a lack of space custom undermines the entire concept of a customary international law of space. According to one estimate in 2000, only six to ten countries had been sufficiently involved in space relations to consider their actions as contributing to international space law.” Jacob M. Harper, Technology, Politics, and the New Space Race: The Legality and Desirability of Bush’s National Space Policy Under the Public Law.” Jacob M. Harper, Technology, Politics, and the New Space Race: The Legality and Desirability of Bush’s National Space Policy Under the Public Customary International Laws of Space, 8 CHI. J. INT’L L. 681 n. 42 (2008).

In 1961, the U.N. General Assembly declared that international law applies to outer space and celestial bodies. It also declared outer space and celestial bodies free for exploration and use by all nations, and not subject to national appropriation. U.S. General Ass. Res. 1721 (Dec. 20, 1961). The following year, the General Assembly called upon nations “to co-operate in the further development of law for outer space”, U.S. General Ass. Res. 1802 (Dec. 14, 1962). The U.N. General Assembly has passed numerous resolutions addressing space, of which the most prominent include:

- The Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (the “Legal Principles Declaration”);
- The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (the “Direct T.V. Broadcasting Principles”);
- The Principles Relating to Remote Sensing of the Earth from Outer Space (the “Remote Sensing Principles”);
- The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (the “Nuclear Power Principles”); and
- The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (the “International Cooperation Declaration”).

General Assembly Resolutions are not binding upon U.N. member States, per se, even those that voted in favor of them, unless they reaffirm existing – or eventually evolve into – general principles of customary international law. Nonetheless, they do offer some indication of consensus of where international law may be headed.

See Steven Freeland, For Better or Worse? The Use of ‘Soft Law’ Within the International Legal Regulation of Outer Space, XXXVI ANNALS OF AIR & SPACE L. 409 (2011). Gérardine Goh writes: “The complexity of space activities has quickly outrun traditional methods of lawmaking. This has led to the necessitation of action from international organizations, specialized agencies, private bodies and professional associations that do not nicely fit into the State-centric paradigm of international lawmaking.” Gérardine Meishan Goh, Softly, Softly Catchee Monkey: Informalism and the Quiet Development of International Space Law, 87 Neb. L. Rev. 725, 726 (2009). Christine Chinkin writes that, “The complexity of international legal affairs has outpaced traditional methods of law-making, necessitating management through international organizations, specialized agencies, programmes, and private bodies that do not fit the paradigm of Article 38(1) of the Statute of the [International Court of Justice]. Consequently the concept of soft law facilitates international co-operation by acting as a bridge between the formalities of law-making and the needs of international life by legitimating behavior and creating stability.” COMMITMENT AND COMPLIANCE: THE ROLE OF NON-BINDING NORMS IN THE INTERNATIONAL LEGAL SYSTEM (Dinah Shelton, ed., New York: Oxford University Press, 2000).

But the view that non-binding “soft law” agreements such as the Space Mitigation Guidelines have become customary international law is not universally shared. “The final potential source of international space law that must be considered is customary international law. Many commentators argue that the content of the nonbinding agreements ...from the Principles through the codes of conduct, could become, or even already have become, binding norms of customary international law... However, closer analysis of the requirements for customary international law demonstrates that nonbinding space agreements are unlikely to evolve into binding customary rules. The practices contained in nonbinding international space agreements do not meet the requirements of either the traditional or the modern approach to custom formation. State practice in outer space is not long-term enough to be the driving force behind the
formation of international custom, especially with regard to the more recent technical agreements, and statements of opinio juris have been far from the strong and nearly unanimous sentiment needed for opinio juris to be the leading factor. When considering the legal effects of nonbinding agreements for the purposes of rule of law, we must thus acknowledge that they are truly nonbinding and will not likely become otherwise through customary international law.” Brian Wessel, *The Rule of Law in Outer Space: The Effects of Treaties and Nonbinding Agreements on International Space Law*, 35 Hastings Int’l & Comp. L. Rev. 289-297 (2012) [citations omitted]. Similarly, Professor Freeland notes, “These soft law instruments provide guidelines or standards of conduct that may often influence the actions of States…, but they do not in and of themselves have the legal ‘force’ of binding treaties… it is not appropriate to convert in our mind something that is not binding ‘hard’ law, and not intended to be such, into a binding rule or obligation.” Steven Freeland, *For Better or Worse? The Use of ‘Soft Law’ Within the International Legal Regulation of Outer Space*, XXXVI Annals of Air & Space L. 409, 434, 444 (2011).

See PAUL STEPHEN DEMPSEY, PUBLIC INTERNATIONAL AIR LAW (McGill 2008).


European Space Policy Institute, Economic and Policy Aspects of Space Regulations in Europe, Part I (Sept. 2009).

Presidential Decree No. 02-49 “Creation, Organization and Functioning of the Algerian Space Agency (ASAL)” of 16 January 2002; Presidential Decree No. 06-225 “Ratifying the Convention for Damage Caused by Space Objects” of 24 June 2006; Presidential Decree No. 06-468 “Ratifying the Convention on Registration of Objects Launched into Outer Space” of 11 December 2006.

National Decree No. 995/91 “Creation of the National Commission on Space Activities” (28 May 1991); National Decree No. 125/95 “Establishment of the National Registry of Space Objects Launched into Outer Space” (25 July 1995).


Law 8.854 of February 10, 1994; Law 9.112 of October 10, 1995; Decree 1.953 of July 10, 1996; Administrative Edit n. 27 of June 20, 2001; Administrative Edit n. 5 of February 21, 2002; Resolution No. 51 of 26 January 2001; Administrative Edit n. 96 of 30 November 2011.

Canadian Space Agency Act (1990, c. 13).

Supreme Decree No. 338, Establishment of a Presidential Advisory Committee known as Chilean Space Agency, amended by Supreme Decree No. 0144 of December 29, 2008, Being now the Chilean Space Agency presided by the Undersecretary of Economy.

Measures for the Administration of Registration of Objects Launched into Outer Space of 8 February 2001; Interim Measures on the Administration of Permits for Civil Space Launch Projects of 21 December 2002; Interim measures on Administration of Mitigation of and Protection against Space Debris.

Decree 2442, of July 2006 on the creation of the Colombian Commission of Space (CCE).


Basic Space Law (Law No.43, 2008 of 28 May 2008); The Law concerning Japan Aerospace Exploration Agency (Law No. 161 of 13th December 2002).

Law of the Republic of Kazakhstan on Space Activities, 6 January, 2012, No. 528-IV; available at
[50] Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (Space Activities Act) of 24 January 2007; Decree Concerning Rules With Regard to a Registry of Information Concerning Space Objects (Space Object Registry Decree) of 13 November 2007; Order Concerning Licence Applications for the Performance of Space Activities and the Registration of Space Objects of 7 February 2008, as amended by Order of 16 April 2010.


[54] Space Affairs Act, No. 84 (1993); Space Affairs Amendment Act, No. 64 (1995); South African National Space Act 36 of 2008.


[70] Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (Space Activities Act) of 24 January 2007; Decree Concerning Rules With Regard to a Registry of Information Concerning Space Objects (Space Object Registry Decree) of 13 November 2007; Order Concerning Licence Applications for the Performance of Space Activities and the Registration of Space Objects of 7 February 2008, as amended by Order of 16 April 2010.


[72] Id. Art. 11.


[74] Act on Launching Objects from Norwegian Territory into Outer Space. (No. 38, 13 June. 1969).

[75] Id.
[76] Space Affairs Act, No. 84 (1993); Space Affairs Amendment Act, No. 64 (1995); South African National Space Act 36 of 2008.

[77] Union of South Africa, Space Affairs Act (Act No. 84 of 1993), as amended by the Space Affairs Amendment Act (Act No. 64 of 1995).

[78] Act on Space Activities (1982-963); Decree on Space Activities (1982-1069).

[79] The statute specifies that receiving signals from space is not considered to be a space activity, nor is a sounding rocket launch. Id.


[81] Outer Space Act (1986). These statutes are reproduced in PAUL STEPHEN DEMPSEY, SPACE LAW (Thomson Reuters/West 2014).


[85] 49 U.S.C. § 70104(a)(2). Chapter 701 of Title 49 of the United States Code confers upon the U.S. Secretary of Transportation authority to issue launch vehicle and site certificates and permits and regulate their operations. This authority, in turn, has been delegated by the Secretary to the Federal Aviation Administration [FAA].

[86] 49 U.S.C. § 70104(a)(1). However, “amateur rocket activities” are not licensed by the FAA, although an Experimental Airworthiness Certificate may be required. Such launch activities conducted at private sites must satisfy the following characteristics: -Powered by a motor(s) having a total impulse of 200,000 pound-seconds or less; -Total burning or operating time of less than 15 seconds; and -A ballistic coefficient- i.e., gross weight in pounds divided by frontal area of rocket vehicle-less than 12 pounds per square inch.

[87] However, U.S. government space activities (such as those by NASA and the Defense Department) are not subject to FAA jurisdiction.

[88] 68 Fed. Reg. 59977 (Oct. 20, 2003). The CLS gave the FAA jurisdiction to regulate commercial space activities, “only to the extent necessary to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interest of the United States, ...encourage, facilitate, and promote commercial space launches by the private sector, recommend appropriate changes in Federal statutes, treaties, regulations, policies, plans, and procedures, and facilitate the strengthening and expansion of the United States space transportation infrastructure.”

[89] An exemption applies if the vehicle is launched from a private site and the rocket: (1) has (a) motor(s) with a total impulse of 200,000 pound-seconds or less; (2) and a total burning time of less than 15 seconds; and (3) has a ballistic content of less than 12 pounds per square inch. 14 CFR § 400.2.


[95] Oversight of space activities is provided by the National Commission on Space Activity (CONAE) (Art. 2 Decree No. 995/91); National Decree No. 995/91, Creation of the National Commission on Space Activities (28 May 1991); National Decree No. 125/95, Establishment of the National Registry of Space Objects Launched into Outer Space (25 July 1995).


[98] Law 8.854 of February 10, 1994; Law 9.112 of October 10, 1995; Decree 1.953 of July 10, 1996; Administrative Edict n. 27 of June 20, 2001; Ad-
ministrative Edit n.5 of February 21, 2002; Resolution No. 51 of 26 January 2001; Administrative Edit n. 96 of 30 November 2011.


[101] Id. Art. 12.


[105] Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (Space Activities Act) of 2006 § 6; Decree Containing Rules with Regard to a Registry of Information Concerning Space Objects (Space Objects Registry Decree) of 13 November 2007; COPUOS, Schematic Overview of National Regulatory Frameworks For Space Activities, A/AC.105/C.2/2010/CRP.12 (24 March 2010).

[106] Id. § 6.


[109] Id. § 12.

[110] Id. § 16.

[111] Id. § 19.


[114] Id. Art. 14, 15.


[116] Id. Art. 6.

[117] Id. Art. 5.


[121] Id. Art. 6(2)(f).


[123] Kingdom of the Netherlands, Rules Concerning Space Activities and The Establishment of a Registry of Space Objects (Space Activities Act) Ch. 2 § 1(3) (2006), available at PAUL STEPHEN DEMPSEY, SPACE LAW § 26:1 (Thomson Reuters/West 2011).


[126] Id. Art. 6(2)(d).


[128] Kingdom of the Netherlands, Rules Concerning Space Activities and The Establishment of a Registry of Space Objects (Space Activities Act) Ch. 2 § 1(3) (2006), available at PAUL STEPHEN DEMPSEY, SPACE LAW § 26:1 (Thomson Reuters/West 2011).

[129] Article 5 of the License Measures.

[130] Article 5 of the License Measures.

[132] Outer Space Act (1986); see also Sa’id Mosteshar, Regulation of Space Activities in the United Kingdom, in NATIONAL REGULATION OF SPACE ACTIVITIES 357, 359-62 (Ram S. Jakhu ed., 2010).


[136] Id. § 21.

[137] Kingdom of the Netherlands, Rules Concerning Space Activities and The Establishment of a Register of Space Objects (Space Activities Act) Ch. 2 § 1(3) (2006), available at PAUL STEPHEN DEMPSEY, SPACE LAW § 26:1 (Thomson Reuters/West 2011).


[139] The Commission of Science, Technology, and Industry for National Defense (COSTIND) of the Peoples Republic of China enacted the Interim Measures on the Administration of License for Civil Space Launch Projects (hereinafter the License Measures) in 2002, available at PAUL STEPHEN DEMPSEY, SPACE LAW § 16:3 (Thomson Reuters/West 2011). Any launch of a spacecraft from the territory of China into outer space for civil purposes, and the overseas launch while the spacecraft has been transferred to, or the ownership of the spacecraft is owned by, or the ownership of the spacecraft has been transferred to, the natural or juridical persons or the other organizations of China, are subject to these provisions.

[140] Article 6 of the License Measures.

[141] Id.


[145] Id. Art. 4(1).


[147] See European Space Policy Institute, Economic and Policy Aspects of Space Regulations in Europe, Part I 5 (Sept. 2009). In 2001, China established a registry of space objects launched into Earth orbit or beyond. See UN Doc. ST/SG/ SER.E/INF.17. Pursuant to the Measures for the Administration of Registration of Space Objects, the registry is maintained by the CNSA. On June 8th, 2005, China informed the Secretary-General of the United Nations of the establishment of such a registry. Currently, the Chinese registration mechanism consists of two stages of registration: the national registration and the international registration.


[152] Article 16 of the License Measures.


[156] Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (Space Activities Act) of 24 January 2007; Decree containing Rules With regard to a Registry of Information Concerning Space Objects (Space Objects Registry Decree) of 13 November 2007; Order Concerning Licence Applications for the Performance
of Space Activities and the Registration of Space Objects of 7 February 2008, as amended by Order of 16 April 2010.


[158] Id. § 22.

[159] Id. § 35.


[163] Id. Art. 27.

[164] Id. Art. 29.

[165] Id. Art. 29.


[174] If States do not believe that the existing Space Law Conventions have “adequate mechanisms to enforce the signed treaties, they may elect to attract space business by maintaining minimal environmental and safety regulations.” Adrian Taghdiri, Flags of Convenience and the Commercial Space Flight Industry: The Inadequacy of Current International Law to Address the Opportune Registration of Space Vehicles in Flag States, 19 B.U. J. SCI. & TECH. L. 405 (2014).

[175] “The interplay between domestic legislation and international law will become an increasingly important theme in the development of international space law. This is especially true if the number of commercial actors proliferates as predicted. It should also be noted that as domestic law develops and defines items such as best practices for space flight providers, these developments can have influence at the international level and on the development of soft law mechanisms.” P.J. Blount, Renovating Space: The Future of International Space Law, 40 DENV. J. INT’L L. & POL’Y 515 (2012).

Progress in space safety lies in the acceptance of safety design and engineering as an integral part of the design and implementation process for new space systems. Safety must be seen as the principle design driver of utmost importance from the outset of the design process, which is only achieved through a culture change that moves all stakeholders toward front-end loaded safety concepts. Superb quality information for engineers, programme managers, suppliers and aerospace technologists.

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