

# Launching from the Moon, Mars and Other Celestial Bodies

## *A Legal Analysis*

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### **Abstract**

A great number of today's plan for future space exploration programs involve launches from another celestial body. Whether it is to bring back samples, astronauts, or to proceed to a commercial launch, those operations raise specific legal issues. Reinforced by decades of experience, the involvement of new actors as well as a diversified and greatly increased activity, space law has evolved since the last launch departing from the Moon in 1972 (Apollo 17). This article addresses the many issues that such activity will bring up from a legal perspective at all levels of the legal framework governing space activities, that is, international, national and private law. With regards to international space law, this article will focus on the application of the "launching State mechanism" on another celestial body, the planetary protection and environmental requirements, the space debris issues and the international cooperation requirements. With regards to national space legislations and private law practices, it will address the questions raised by the new criteria required by States in order to deliver the authorization and license to launch, and the implications of such launching activity in the insurance market. By addressing chronologically each of the steps involved in a launch, from the authorization process to the "end of life" of the launcher's stages, this article will present the legal environment of this launching activity. If launching from Earth is today a well-defined operation, launching from another celestial body raises new legal issues.

**Keywords:** Launch, celestial bodies, space law.

### **1. Introduction**

On December 14<sup>th</sup> of 1972, astronauts Harrison Schmitt and Gene Cernan of the Apollo 17 mission were launched from the Moon. They joined their colleague astronaut Ronald Evans, stayed on orbit around the Moon, and came safely back to Earth. They are the last astronauts to have been launched from another celestial body.

Sending men on the Moon, Mars or any other celestial body implies to get them back on planet Earth. Many of today's space exploration projects

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involve the settlement of a human base on another celestial body and the return of astronauts. The “Moon Village” concept, developed by the European Space Agency (ESA) and that would be conducted in a large international cooperation, as well as the “Journey to Mars” effort, developed by the National Aeronautics and Space Administration (NASA), involve, at some point, a launch from respectively the Moon and Mars, in order to get astronauts, scientific experiments or samples back to Earth. Furthermore, the various space resources exploitation projects, supported by private companies and States, usually involve the return of resources on Earth or the use of those resources for launches from the celestial body on which they are taken. It is finally the case concerning the space tourism projects involving the Moon in particular.

Thus, from a certain point of view, the launch from another celestial body appears to be a common phase of today’s plans for futures deep space operations.

If much of those projects have never be intended before, the launch of a space object from a celestial body has already be performed, at least 6 time.<sup>1</sup> Furthermore and on a legal perspective, the Sea Launch Project, consisting in the launch of space objects from the high sea have already led to interesting legal analysis. Indeed, the high sea as the outer space are *res communis*, there is a freedom of access and use and its necessary corollary, a non-appropriation principle.<sup>2</sup> The launching activity from such territories is not subject to a specific legal framework. Regarding the scale of today’s projects, the frequency of the launches potentially involved, that drastically differs from the precedent launches performed from the Moon, and the growing capacity to perform them, the study of the legal issues raised by such an activity and the clarification of the legal framework in which it shall be conducted might be developed.

If the launching activity is today strictly framed on Earth, no specific regulations exist for launches occurring from other celestial bodies. Many specificities shall however be taken into consideration. Moreover, the study of the legal aspects raised by this activity is the occasion to develop and to precise space law concepts and definitions that are of major importance for today’s programs and employed for a great number of space operations. It has to be underlined that this article will be dealing with the launches from other celestial bodies, excluding the launches of a space object from another space object. Those launches and especially the launch of cubesats from the Kibo module of the International Space Station (ISS), raise both similar and specific issues.

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1 Apollo missions 11, 12, 14, 15, 16 and 17.

2 A. Kerrest, “Le principe de non-appropriation et l’exploitation de la Lune et des autres corps célestes”, in: P. Achilleas (ed.) *Droit de l’espace*, Larcier, 2009, p. 343.

Traditional space law concepts and principles, such as the launching State mechanism, the liability regime that is based on it, as well as the definition of a space object or the planetary protection requirements, are at the heart of such an operation. Therefore, launching from another celestial body implies to apply existing concepts and definitions, that may need to be adapted or developed in order to take into consideration specific requirements, as well as the creation of new concepts, mechanisms or definitions, that will be needed to offer to this activity a complete legal framework. If international space law issues shall be study at first, developments shall also be conduct regarding national space legislation. Those last legal instruments have the particularity to be at the same time a transcription of international obligations and a mean for States to foster, develop and support space activities. National space laws are of major importance regarding launches, as they set in place the authorisation process and according requirements. In the hypothesis of a launching activity from another celestial body than Earth and depending on the international space law provisions that will apply, national space legislation might have to be adapted or completed, implementing specific provisions, with regards to the authorisation process or the liability requirements for example.

Finally, in order to have a comprehensive vision of the legal framework governing this launching activity, the legal aspects referring to private law practices shall be study as well. If an important part of them will depend on the requirements provided by national space legislation, some practices that are today commonly used between private actors in order to launch a space object, might be adapted to perform this same activity from another celestial body.

The first part of this article will focus on the application of existing space law to the launching activity from another celestial body than Earth, whereas the second part will develop ideas to adapt existing mechanisms and precise the existing definitions, needed to conduct, in a safe and responsible way, this very particular launching activity.

## **2. The Application of Current Space Law**

Any space activity starts with a launch. In 2016, more than 85 orbital launches were performed on Earth.<sup>3</sup> This great number reveals how developed today's launching activity is, performed from 9 different countries in 2016.<sup>4</sup> In addition, global launching activity is growing rapidly, as new actors (such as non-spacefaring nations or private entities), new projects (such as mega constellations or micro-launchers) as well as new needs

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3 "2016 Space Launch Statistics", December 31, 2016, <http://spaceflight101.com/2016-space-launch-statistics/>, (accessed 19.08.17).

4 *Ibid.*

(concerning both civil and military markets) are shifting the activity's paradigm. It might be underlined that the various developments of micro-launchers, pushed in particular by the growing capacity of "small sats", are all associated with a very high frequency of launches, which is likely to double the overall number of launches.

As the very first phase of any space operation and as a regularly practiced activity, the launch of a space object is well governed by a complete and proven legal framework. The decades of experience that institutional and commercial actors involved in the conduct of launches, has drawn a comprehensive and well defined framework, allowing to conduct this highly hazardous operation in a safe and well defined manner.

The various spaceports from which today's launches are performed on Earth lead to the application of different laws and regulations, depending of the State in which they are located and the geographic area in which they are conducted. Basic principles are however shared between those various frameworks as they all are directly consequent of international space law.

How would those principles apply with regard with a launch performed on the Moon, Mars or any other celestial body? Will all of them be applicable in the same way as they are on Earth? Which other existing space law principles or rules will specifically have to apply in such a launching operation?

A lot of issues raised by a launch operation on Earth would also be raised on a celestial body. Many solutions could be used on the two hypothesis, other will have to be adapted or created *ab initio*. This first part will address the current international space law's dispositions applying to such an operation. It will first study the existing provisions regarding activities conducted on celestial bodies (1), before developing provisions concerning the launching activity (2), more specifically the liability regime.

## **2.1 International Law Provisions Regarding Celestial Bodies**

International space law is fully applicable to activities conducted on a celestial body, as established in the title itself of the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* of 1967 (Outer Space Treaty, OST).

If only few provisions directly concern activities conducted on celestial bodies, all of them are of major importance for the definition of a clear legal framework regarding the launching activity from those celestial bodies. Moreover, it has to be recalled that all of the general principles provided by the treaties and governing the conduct of space activities also apply to celestial bodies. They will then be fully integrated in the general framework governing those activities.

As a consequence, the activity consisting in launching from a celestial body, which constitutes a space operation, shall be carry out, as the general "use of outer space", "for the benefit and in the interests of all countries, irrespective

of their degree of economic or scientific development, and shall be the province of all mankind”.<sup>5</sup> They shall be conducted “in accordance with international law (...) in the interest of maintaining international peace and security and promoting international cooperation and understanding”.<sup>6</sup> Finally, it shall be recalled that States don’t have the obligation to launch from their territories.<sup>7</sup>

Beyond those established principles, applying to the entire “exploration and use of outer space”, activities conducted on celestial bodies shall also comply with more specific dispositions.

First of all, international space law provides a principle of free access to all parts of celestial bodies.

The second paragraph of the very first article of the Outer Space Treaty establishes the principle of free exploration of outer space, including celestial bodies, and states that “there shall be free access to all areas of celestial bodies”. This precision prevents arguments supporting that the “free access” of a celestial body is not called into question if only a part of it is made inaccessible by a State party of the treaty. This type of argumentation is often used concerning the space resources exploitation, as no explicit precision of this kind exists. Finally, it shall be underlined that, as a launch operation always necessitate to prohibite the access to particular areas, for safety reasons, during the launch period, it will have to be determined how this necessity will comply with the “free access to all areas of a celestial body” requirement. The fact that the prohibition would be temporary will for example be an important point to be analysed.

This provision can however be linked with the “non-appropriation principle”, established on the Article 2 of the Outer Space Treaty, as the fact to prevent others to access a part of a celestial body could, in a sense, be interpreted as an appropriation of the concerned area. It finally has to be read with the Article 12 of the same treaty, establishing a principle of open access of facilities on celestial bodies. According to this article, the free access of “all the stations, installations, equipment and space vehicles” on the celestial bodies to “representatives of other States Parties to the Treaty” is established “on a basis of reciprocity”. This particular condition shall be subject to a specific analyse. The expression “on a basis of reciprocity”

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5 Art. 1, OST.

6 Art. 3, OST.

7 A. Kerrest, “Launching Spacecraft from the Sean and the Outer Space Treaty: The Sea Launch Project”, Proceedings of the Fortieth Colloquium on the Law of Outer Space, IISL, 1997.

should be understood as the capacity for a State to prohibit access to its facilities to another State Party to the Treaty that would have done the same.<sup>8</sup> In the perspective of a launching operation from a celestial body, this first set of provisions has an interest regarding the eventual establishment of facilities that would be necessary to conduct it. By establishing a clear and explicit principle of free access to the celestial bodies, it prohibits the establishment of a launch base or any kind of facilities that would make a surface or an area of the concerned celestial body inaccessible to other States Party to the treaty. This principle of “free access” and the accessibility of “all areas of celestial bodies” is one of major importance due regard with all activities conducted on celestial bodies, and specifically with activities requiring the establishment of permanent facilities.

The article 4 of the Outer Space Treaty states that “the Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes”. This principle is then completed by a set of more details prohibitions, concerning *inter alia* the establishment of military bases or fortifications as well as the testing of “any type of weapons”.

The specific “peaceful purposes” principles applying to activities conducted on celestial bodies is subject to interpretation. Indeed, despite the examples that are stated in the article through the non-exhaustive list of prohibited activities, it doesn’t clarify the very central question: what are “peaceful purposes” in space?

On a legal perspective, the definition of the concept of “peaceful purposes” changes according to the context in which it is employed. As an example, a classical comparison would be the use of the same concept of “peaceful purposes” in the context of nuclear activities and in the context of maritime activities. In the 1956 Statute of the IAEA,<sup>9</sup> “peaceful purposes” clearly refers to “non-military uses”, whereas the same concept employed in the U.N. Convention on the law of the Sea, which provides in particular that the “high seas shall be reserved for peaceful purposes”,<sup>10</sup> would rather refer to “non-aggressive” than “non-military” uses.

In the context of space activities, nor the Outer Space Treaty nor any other text, including the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement, MOON), define the concept of “peaceful activities”, they explicitly prohibit specific activities and “set a global objective of peace and security, the research for a profit for all

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8 B. Smith, Commentary on the Article XII of the Outer Space Treaty, in: Hobe, Schmidt-Tedd, Schrogl (ed.), Cologne Commentary on Space Law, Volume 1, Carl Heymanns Verlag, 2009, p. 211.

9 Art. 3, 11 and 12 of the 1956 Statute of the AIE.

10 Art. 88, U.N. Convention on the Law of the Sea, Dec. 10, 1982.

mankind”.<sup>11</sup> In this context, the concept of “peaceful purposes” may be interpreted as “non aggressive” activities. Therefore, such an interpretation of the concept of “peaceful purposes” in this context would not prohibit the launch of a military satellite from a celestial body (as long as the concerned satellite doesn’t itself conduct aggressive operations, otherwise its launch could be interpreted as being a full part of a larger non-peaceful operation).

In the hypothesis of the conduct of launching activities from a celestial body, a major issue may also reside in the “dual use” of technologies developed and used for launch systems. As a matter of fact, those technologies are very close, when not the same, to the ones used for intercontinental ballistic missiles (ICBM). If the “non-aggressive” use of those technologies may not enter in confrontation with the “peaceful purposes”, the treaty specifically prohibits the “test of any type of weapon” on celestial bodies. The similarity of the technologies could lead to situations in which the use of a launcher on the surface of a celestial body can *de facto* be interpreted as a weapon test, as a great number of technologies used in that launch or that have been developed for it could be very similar with the one of an ICBM.

Finally, the Outer Space Treaty provides, in its article 9 that “States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, shall adopt appropriate measures for this purpose”. It then provides for a process under which States may undertake appropriate consultations when they have reasons to believe that an activity may cause harmful interference.

This article and the general principle of “Planetary Protection” that it establishes are of particular importance regarding the launches conducted on the surface of celestial bodies.

Today’s Planetary Protection requirements essentially concern the compliance with the obligation to preserve celestial bodies (and outer space in general) from the interferences that a space mission would bring from Earth. Space agencies that are conducting scientific space missions and especially inter-planetary space missions usually have an internal office or an advisory board putted in charge of Planetary Protection. Moreover, the Committee on Space Research (COSPAR) edited a Planetary Protection Policy which establishes technical principles and guidance regarding those environmental issues.<sup>12</sup> In the hypothesis of an operation consisting on a launching operation from a celestial body to the Earth, both aspects of Planetary protection would have to be taken into consideration (protection of celestial bodies’ environment

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11 “La notion d’utilisation pacifique dans le droit de l’espace”, G. Lafferanderie, RFDAS 1985, vol. 156, n°4; pp. 427-438.

12 COSPAR Planetary Protection Policy, 20 October 2002; Amended 24 March 2005.

from Earth and of Earth's environment from celestial bodies). Launching constitutes a very risky activity, whether it is conducted on Earth or on celestial bodies. Thus, it has to be underlined that the "risk assessment", part of the definition of a "Planetary protection" plan, will be of particular importance, as the consequences of a launch failure on the surface of celestial body could be very damaging on a Planetary Protection perspective.

Beyond those three sets of provisions that specifically apply to activities conducted on celestial bodies, international space law provides for a very specific framework regarding launches, including registration and liability regimes.

## **2.2 International Law Provisions Regarding the Launching Activity**

Cornerstone of the liability regime applying to space activities, the launching State mechanism shall strictly apply to space operations consisting on a launch from another celestial body.

The launching State mechanism is provided for in the Outer Space Treaty (article 7) and detailed in the Convention on International Liability for Damage Caused by Space Objects of 1974 (Liability Convention, LIAB).

It establishes that the "launching State", meaning the State that (i) launches, (ii) procure the launch, (iii) from whose territory or (iv) from whose facility an object is launched into outer space endorses the international liability for damages caused by this object or by its component parts on Earth, in air space or in outer space, including the Moon and celestial bodies.<sup>13</sup> This principle is then detailed by the Liability Convention, establishing in particular a distinction of the liability regimes between the damages caused on Earth or in air space (strict liability)<sup>14</sup> or in outer space, including the Moon and celestial bodies (fault based liability).<sup>15</sup>

In the event of a launch from a celestial body, those basic principles of space law shall strictly apply.

First of all, it is necessary to determine the launching State of such an operation.

Among the four criteria determining the launching State, only one shall not be applicable to the launch from a celestial body. Indeed, as no part of a celestial body could be subject to national appropriation, in application of the article 2 of the Outer Space Treaty, no launch can occur at the same time from a celestial body and from a "State territory". The three other criteria shall however apply: a State can launch or procure a launch on a celestial body, as well as it can have under its jurisdiction the facilities based on a celestial body from which a launch is performed.

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13 Art. 7, OST.

14 Art. 2, LIAB.

15 Art. 3, LIAB.



Despite the exclusion of the “territorial criteria” in the determination of a launching State, the main issue raised by this mechanism in the event of a launch occurring from a celestial body may reside in the fact that everything – at least for the coming decades – that would be launched from a celestial body would first have been launched from Earth and by consequence, the launching State of the space object may have already been determined.

In order to study the consequences of this particular issue, different cases have to be elaborate. A common interrogation of the four hypothesis that will be elaborated here is the question of the definition of a “launch”. Is the “re-launch” of a same space object from a celestial body constitutes a “launch” as understood in the space treaties, leading to the application of the launching State mechanism and therefore the need to determine them? Would the launching States determined from the first launch will necessarily still be launching States in addition to the new ones? Those issues, which constitute a very central point of the definition of a legal framework governing the launches from celestial bodies doesn’t find any answer in the treaties themselves. The development of those definitions will be addressed in the second part of this article.

First, it is necessary to consider the case of a rocket that is launched from Earth to a celestial body and then re-launched from this celestial body without the use of any *in situ* facilities. The launched space object remains the same one that was launched from Earth.

This hypothesis corresponds to the launched already performed from the Moon during the Apollo missions. On this case, the same launching State did launch the same space object from Earth and “re-launched” it from the celestial body, without the intervention of any other States. No particular difficulties are raised by this situation as the actors of the two launching operations are exactly the same ones. Because of the absence of sovereignty on celestial bodies, this operation do not raises any particular issue regarding the international liability regime for space operations.

The second case that shall be examined is the one of a launch performed from the other celestial body with the use of or from *in situ* facilities which are under the jurisdiction of a State that was not part of the initial launching States determined by the launch performed on Earth.

The jurisdiction of the facilities from which a launch is performed is one of the three criteria that can lead to determine a launching State to a launch operation occurring from a celestial body. In this hypothesis, in addition of the initial launching State, a new one could be determined.

Thirdly, the hypothesis of a launch that is performed or procured from a State that was not part of the initial launching States.

The action to launch or to procure the launch are two of the three criteria by which a launching State could be determined in the context of a launching operation from a celestial body. It shall furthermore be underlined that a situation could occur where the States that respectively launch, procure the

launch and from which facilities the launch is performed can be different on a celestial body as well as on Earth. The joint launching States regime will then apply.

Finally, the case of the launch of a space object that was entirely built on the celestial body.

In this particular hypothesis, the space object launched from the celestial body would not have been previously launched from Earth and therefore, no launching States would already be determined. Logically, the State that launches, procures the launch or from which facilities the space object is launched would be a launching State. The question remains however of the components of the space object. If those were launched from Earth in another space object, their qualification as a space object (and therefore the application of the launching State mechanism and the previous determination of a launching State) shall be discussed. The second part of this article will assess the interrogations regarding those definitions.

Another interesting case may also reside in the hypothesis of a space object that has been subject to *in situ* modifications before its launch from the celestial body. In fact, shall it be considered as the same space object or as a new one. If several States are involved in this all process (including the ones that are the originals launching States), shall they all be considered as joint launching States. Both the concepts of “space object” and of “launch” are mobilized by this question, stressing the need to precise their respective definitions as well as to establish specific mechanisms.

The provisions regarding the registration of space objects and in particular the provisions of the *Convention on Registration of Objects Launched into Outer Space* of 1974 (Registration Convention, LIAB) shall finally be applicable to the space objects launched from a celestial body that are not already registered, as well as the eventual facilities from which the launch will be performed. Therefore, according to Article 1 (1) of the Registration Convention, the launching State of the space object launched from the celestial body will have to register it. Furthermore, the facilities from which it will be launched shall be registered as well. Indeed, as the State’s registration determines the jurisdiction of the space object, by application of the Article 9 of the Outer Space Treaty, the registration of the launching facilities will be of major importance in order to determine the launching State of a space object launched from those facilities on the surface of a celestial body.

As demonstrated in the first part of this article, international space law strictly applies to launch operations conducted on celestial bodies, both on its aspects regarding the activities conducted on the celestial bodies themselves and those regarding the launches, through the principles concerning liability or the registration for example. The principles and rules provided by international space law constitute a first basis for a legal framework governing those activities. They shall however be completed, precised and defined, in order to establish in particular a comprehensive basis for national

space legislation. The second part of this article will assess the issues raised by the previous study on international space law application, especially the interrogations regarding concepts and definitions. It will then study the aspects regarding national space legislation.

### 3. The Need for New Definitions and Adapted Mechanisms

As raised in the first part of this article, international space law is not providing for clear definitions of the terms “launch” and “space object”, which are essential to determine a comprehensive framework governing the launching activity from a celestial body. In order to apply the existing provisions and mechanisms provided by the treaties, they shall be discussed and analysed.

It is possible to define the space object as an “artificial manmade object that is brought into space and is designed for use in outer space”.<sup>16</sup> It can then be easily differentiated with “celestial bodies”, that would then appear as being “the result of the natural creation of the universe”.<sup>17</sup> The only precision regarding the meaning of a “space object” that could be found in the treaties is first stated at the Article 1 of the Liability Convention, which provides that “The term *space object* includes component parts of a space object as well as its vehicle and parts thereof”. This precision is essential to define the applicability of this very specific liability regime. It remains however to precise the meaning of the “component parts of the space object”. It appears that this expression excludes the objects contained on a space object that are not part of it. As an example, the objects, such as supplies or experiments, contained in a cargo ship sent to the ISS are not space objects, unlike parts of the cargo ship itself, such as elements of its structure or mechanism, or its vehicle and its parts.

On the perspective of a launch from a celestial body, the consequences of this precision regarding “space objects” is that a space object contained on another space object but not part of it, would not have any launching State until it is launched itself (from a celestial body for example). The two objects would therefore not necessarily share the same launching State. It will be necessary to determine the launching State of the second space object when it will be launched from the celestial body, by application of the criteria recalled earlier on this article. This precision also is of particular importance in the hypothesis of a space object built and launched from a celestial body. If its components are not the components of another space object that has

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16 S. Hobe, Commentary on the Article I of the Outer Space Treaty, in: Hobe, Schmidt-Tedd, Schrogl (ed.), Cologne Commentary on Space Law, Volume 1, Carl Heymanns Verlag, 2009, p. 32.

17 *Ibid.*

already been launched, the space object built on the celestial body will not have any launching State until it is launched itself.

A second essential concept which is not defined on the treaties is the “launch” itself. As it is the case for the expression “space object”, the only precision that could be found in the treaties is at the Article 1 of the Liability Convention, which specifies that “The term *launching* includes attempting launching”. This precision is essential to apply the space liability regime in the event of a launch failure, but does not constitute, as such, a definition of the term itself. Some national space legislation does however provide for a definition of a “launch”. It is the case in the United States national space law, which defines the launch as the action “To place, or attempt to place, a launch vehicle and its payload, if any, in a suborbital trajectory, in Earth orbit in outer space, or otherwise in outer space”.<sup>18</sup> The French national space law, doesn’t define the “launch” but the “launch phase” as the “period of time, in a space operation, which starts at the moment of which the launching operations become irreversible and (...) that ends at the separation of the launcher from the object which is intended to be placed into outer space”.<sup>19</sup> It is noteworthy that none of those two definitions states that the launch has to be conducted from Earth.

A clear international definition of the “launch” concept would help to determine whether a new launch of a same space object “cancels” the juridical consequences of the previous one. In other terms, it would help to determine if the launching States of space object will remain its launching States after that the same object is launched again, from a celestial body, by other States. Precising those concepts appears as a necessity to develop accurate mechanisms that are missing on international space in order to regulate the launching activity from celestial bodies. One of those mechanisms could for example provide that the launching States of a space object which is launched for a second time are only the ones determined by this second launch.

#### **4. The Essential Role of National Space Legislation**

National space laws can often be seen as the way for States to comply with their international obligations. They all present similarities, the so called “building blocks”, directly coming from international space law, but often present differences. They are the set of rules applicable to private entities.

Among those “building blocks” is the authorisation process necessary to conduct a space operation. As the launch from a celestial body constitutes a space operation, requirements associated with the authorisation to conduct a

<sup>18</sup> National Aeronautics and Space Act, 51 U.S.C., § 50501 (5) (2010).

<sup>19</sup> Loi n°2008-518 du 3 juin 2008 relative aux opérations spatiales, Art. 1 (4). [Translation of the author].

space operation may be completed in order to include the specificities of such an activity. In this perspective, provisions related to Planetary Protection or to the free access to all parts of the celestial body will for example be of particular importance.

Moreover, the implementation on national space legislation of new requirements for launching activities performed from celestial bodies will be a unique occasion to anticipate as from now the issues that are known today on Earth, such as the space debris. Indeed, a regular launching activity from a celestial body could lead to the same space debris issues that exists today on Earth. The provisions that do not exist on national space legislation could be implemented regarding the launches from celestial bodies in order to prevent today the issues that a regular launching activity from a celestial body could lead to in decades.

Finally, it should be noted that in the hypothesis of a launch activity conducted by private actors on the celestial bodies, the private law mechanisms usually used on space activities will have to be adapted. Innovative insurance contracts will for example have to be invented. Those mechanisms will first be the consequence of the national space legislation.

## **5. Conclusion**

As a conclusion, we can state that by their application to the launching activity from celestial bodies, international space law principles give a first general legal framework through three sets of principles. First, the general principles that are applying to all space activities, such as the freedom of exploration and use as well as the conduct of space exploration and use for the benefit and in the interests of all countries. Then, the principles specifically related to activities conducted on celestial bodies, such as the specific peaceful purposes requirement or the Planetary Protection issues. Finally, the principles that are more linked to the launching activity, such as the liability regime or the registration of space objects.

The good application of those principles is however submitted to the existence of precise definitions of the concepts of “space object” and of “launch”. International space law doesn’t provide for precise definitions of those two concepts. Clear definitions would allow to establish the mechanisms needed to regulate this activity.

Finally, national space legislation, as it is the case for launching activities conducted on Earth, will have to implement a specific legal framework based on State’s international obligations. This framework, that will be the one applying to private entities, will constitute a precious opportunity to deal, as from now, with issues that the launching activity conducted to on Earth, in order to avoid them on celestial bodies, such as space debris.

