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Intellectual Property Implications in the Context of Space Exploration with a Focus on European Space Agency Rules and Regulations

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***Abstract*—**This article details the manner in which European law establishes the protection and ownership rights over works created in off-world environments or in relation to space exploration. In this sense, the analysis is focused on identifying the legal treatment applicable to creative works based on the provisions regulated under the International Space Treaties, on one side, and the International Intellectual Property (IP) Treaties and subsequent EU legislation, on the other side, with a special interest on European Space Agency (ESA) Rules and Regulations. Furthermore, the article analyses the manner in which ESA regulates the ownership regime applicable for creative works, taking into account the relationship existing between the inventor/creator and ESA and the environment in which the creative work was developed. Moreover, the article sets a series of *de lege ferenda* proposals for the regulation of IP matters in the context of space exploration, the main purpose being to identify legal measures and steps that need to be taken in order to ensure that creative activities are fostered and understood as a significant catalyst for encouraging space exploration.

***Keywords*—**ESA guidelines, EU legislation, intellectual property law, international IP treaties.

I. Introduction

AN important element in the study of human settlements is the research and understanding of arts and innovations developed by its inhabitants. The level of complexity reached by these expressions of the human mind is directly linked with the overall level of development of the respective society and codification of fundamental laws and customs.

In our times, the human creative activity is undergoing a major shift triggered mainly by the development of new technologies and the amplification of human space exploration. In this context, the rules of law that govern our society as a whole are faced with the question of the manner in which they are required to adapt and grow in order to embrace the new paradigm and answer to the different types of scenarios that humankind is experiencing as it embarks in this new era in space exploration.

The Outer Space Treaty [1] regulates the matter of extraterritoriality and space exploration in a manner that ensures the common access and freedom of research to all Signatory States, emphasizing on the importance of cooperation and activities that benefit to all countries.

From an IP standpoint, the fact that the Outer Space Treaty expressly stipulates that outer space *is not subject to* any *national appropriation*, generates a series of legal questions regarding the manner in which the applicable law is being determined for creative works that are developed in such environments. Taking into account this aspect, the ESA has laid down a series of general contractual terms and principles that are intended to be a starting point for negotiation and contractual regulation of issues regarding IP. These rules are only applicable in relation to third party providers of ESA, irrespective of the place in which the creative activity is undertaken by the provider, i.e., on Earth's surface or in the outer space. However, given the complexities of the creative activities that may be assumed in the outer space environments it is possible and plausible to imagine cases in which the general contractual clauses proposed by ESA should be supplemented either thorough cooperation agreements concluded between countries and space agencies (as in the case of the International Space Station and the Intergovernmental Agreement) or through new legal provisions. Thus, in the current context, questions may arise from the fact that most legal rules governing creative activities developed in the outer space or related to space activities are regulated contractually without the existence of a specific legal framework.

The necessity for regulating legal provisions that establish the manner in which creative works may be exploited both on the Earth's surface (for creations developed in the outer space) and in outer space (irrespective of the place in which the creation was developed) is becoming an important subject taking into consideration the envisaged cooperation between national space agencies and private partners for the manufacture and operation of the Lunar Gateway, the Artemis missions and future deep space exploration.

This article analyzes the manner in which ESA has regulated IP matters in the intent to reconcile the status of space as *common province of all mankind* and the territoriality principles laid down under the International IP Treaties which recognize only a territorial ownership over creative works. Section II describes the means in which the applicable law is determined for creative works under the IP Treaties and implementing EU legislation and the relevance of such rules from the perspective of the Space Treaties. Part II details the IP rules set under the General Clauses and Conditions for ESA Contracts [2] which are applicable in relation to third party providers. Part III

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describes the manner in which ESA regulates creative activities that are developed by ESA staff, fellows or experts [3]. Part IV presents a series of *de lege ferenda* proposals taking into account the conclusions emphasized in this article and the fact that creative activities should be fostered and understood as a significant catalyst for encouraging space exploration.

II. Determining the Applicable Law to Creative Works under IP Treaties and EU Regulations: Importance from the Perspective of the Space Treaties

A. General Context

As a general principle, the matter of territoriality in relation to IP rights is derived from the general principles of the IP Treaties [4] that identify the legal framework applicable to a creative work based on the creator's/creative activity's state of origin. The establishment of the IP Treaties ensured a common recognition of the rights granted to their rightful holders and certain other harmonization of rules between Signatory States (e.g., types of agreements ensuring monetization of the creative work, mutual recognition principles etc.), which were further developed under the TRIPS Agreement [5]. Moreover, the territoriality of IP rights is further underscored in the international IP Treaties by the principle of independence of rights, which gives effect to a granular perspective in terms of regulating and protecting IP. In this respect, the Paris Convention for the Protection of Industrial Property provides for the mutual independence of patents and trademarks, establishing that patents obtained for the same invention in multiple countries are independent of each other (Article 4bis) and that trademarks registered in a Signatory State are independent of those registered in other states (Article 6). The main effect of such regulation is that these IP rights, once granted, remain independent and unaffected by the fate of registrations of the same subject matter in other states, and operate within the territorial boundaries of local protection [6].

In this context, the systematization and automatic applicability and recognition in the area of ownership and registration of intellectual property rights (IPRs) in the EU is still in process of being consolidated, with the sole exception of the European Union trademark and design framework [7], which ensures at the level of the EU a full and automatic recognition of registration in all Member States, without any other additional procedures or implementing examinations in each Member State. However, this is not the case of inventions, which, until full implementation of UPC Agreement [8], are governed by the European Patent framework [9]. Under this framework, the application does not automatically take effect in the designated countries, being necessary for the application to undergo a subsequent examination in each designated state of protection. In this sense, the current procedure may be regarded solely as a centralized system for simultaneous filing of patent applications, that after granting of the patent relies mostly on national laws and national enforcement procedures.

In addition, while the European Union trademark and design framework is applicable *ope legis* in all EU Members States, both the UPC Agreement and the European Patent framework are subject to ratification by the European States being treated as a distinct legal framework from that of the body of laws established by the EU. This aspect is important, taking into consideration that there is no fixed overlapping between the states that recognize and apply the EU trademark and design framework and the ratifying states of the UPC Agreement or of the European Patent framework.

The complexity of the matter becomes even more advanced in the case of copyrightable creations (such as software, data bases, digital creations etc.) which, in general, are governed by the legislation of each EU Member State and are subject to registration with local copyright authorities only for opposability purposes, based on the Latino-Germanic system of registration [10] that is applicable in most EU Member States.

Taking into consideration the above-mentioned legislative context, and the fact that ESA is an intergovernmental organization having 22 Member States which regulate separately the matter of IPRs into their national legal systems, the ramifications and difficulties to establish the applicable law for creative works developed in the outer space becomes even more challenging.

B. Applicable Law for Creative Works under the IP Treaties

As mentioned above, the overarching principles instilled by the IP Treaties are the territorial limitation of rights granted to rightful holders and the exclusive sovereign option of Signatory States to decide the manner in which they regulate internally the matter of IPRs, under the condition of mutual recognition. These principles have been interpreted so far as ensuring a limited degree of consolidation for rightsholders of the necessary actions to be taken in order to ensure protection in cases of infringements or even in the creative activity process; inferring thus that the fragmentation of regulations governing the IPR protection generates distinctive practices and requirements specific for the territory of each state.

Although, Vienna Convention [11] regards these principles as being immutable, strictly from a public international law perspective, the manner in which the customs are formed and interpreted by states yields the possibility of adjusting future interpretation of these principles, including defining in a clear and sustaining manner the limit between outer space and airspace. This could be regarded as a possible alternative to the regulation of new legal frameworks on matters related to space exploration, i.e., by regulating supranational principles or provisions that are specifically applicable in outer space as distinct to national regulations.

In principle, from the perspective of the IP Treaties, there are two main rules that determine the governing law applicable to creative works, respectively:

- The Berne Convention (Article 5) refers mainly to the notion of the *country of origin* when determining the applicable law in relation to rights, registration requirements and enforcement of copyrightable works, and
- The Paris Convention (Article 4) establishes the applicable law based on the territory for which protection is claimed (*lex loci protectionis*).

Both rules entail territorial principles and protection, leaving

the choice of identifying the protection territory to the rightful holders. This means of regulating infers that clear contractual provisions should be at the basis of all creative activities that are performed/developed in the outer space, giving more importance to the manner in which ESA has decided to solve the matter of IPRs in its General Clauses and Conditions for ESA Contracts.

As a conclusion, strictly from the perspective of the international law, it may be construed that the treaties under the auspices of WIPO as well as the TRIPS Agreement have achieved a certain level of harmonization among national/ regional laws. However, there still remain considerable differences among national/regional IP laws which lead to a different level of IP protection in the territory of each country (region) [12] and a diverse manner in which the provisions regulating the governing law are applied.

C. Applicable Law for Creative Works under the EU Law

In comparison to the International IP Treaties in the case of EU law, the matter of territoriality is regarded as more supple and adjustable taking into account that certain sovereign attributes of the Member States are bestowed to the EU. This gives raise to potentially regulating more straightforward frameworks that will ensure automatic registration even in the case of inventions, as we experience in the case of trademarks and industrial design.

The general rules regarding the governing law applicable to creative works is determined based on the following:

- For creative works that are subject to mandatory registration requirements, such as inventions or logos, the applicable law is determined based on the territory for which protection is claimed (*lex loci protectionis*) or, in some cases, as a secondary option (i.e., for works that are pending registration formalities), for works developed under a contractual relationship the law applicable to the contract; while
- For copyrightable creative works the applicable law is determined based on the creator's *principal home* or, where the work was created under a contractual relationship, the law that applies to the contract.

An additional option, applied mainly in cases where the creative activity is not subject to any contractual provisions (e.g., innovative works complementary or contiguous to a contractual relationship) is to consider the applicable law based on the place of the creator's specific performance, which in certain cases is identical with the creator's *principal home*.

Even if from a regulatory perspective the rules appear to be similar to those regulated under the international IP Treaties, it should be taken into consideration that the degree of harmonization and level of integration between EU Members States on matters related to IP is greater, taking into consideration that the EU law has additional resorts that ensure mandatory general interpretation of its rules through the preliminary rulings of the Court of Justice of the European Union (the CJEU). In this sense, in accordance with the settled case-law of the CJEU, EU legislation must, so far as possible, be interpreted in a manner that is consistent with international law [13]. That applies in particular where such a text has recourse to specific concepts employed in an international agreement concluded under the aegis of an international organization [14]. Thus, it may be argued that future interpretation of the CJEU may enable a better understanding of the manner in which the EU provisions regarding the choice of governing law is correlated to space activities.

As a conclusion, the EU legal framework provides more options for determining the applicable law in the case of creative works. However, as stated by the CJEU provisions that implement international treaties at the level of the EU legislation should follow the interpretations and customs that are established based on international law principles. Moreover, it may be regarded that the CJEU could further interpret based on preliminary rulings that correlation between EU provisions on IP and the international Space Treaties.

D. Definition of IP Rights under the General Clauses and Conditions for ESA Contracts and Determination of Applicable Law

According to the General Clauses and Conditions for ESA Contracts (ESA Rules) [20], the notion of *intellectual property rights* is defined in a broad manner encompassing both works protected under patent laws, trademark and design laws as well as copyrightable creations and trade secrets. Thus, ESA Rules ensure a contractual consolidation of the legal provisions stipulated by the International IP Treaties and the EU legislation mentioned above. In this regard, ESA Rules (Clause 34) stipulate the following:

- All agreements concluded with third party providers expressly settle on the governing law applicable to the agreement.
- The applicability of the governing law is limited to matters that surpass the clauses stipulated by the agreement or ESA Rules or for the interpretation of ambiguous provisions.

In addition to the above, Clause 40 and Clause 54 of ESA Rules clearly make the distinction between the performance of the agreement (governed by the parties' chosen law) and the provider's right to register the resulted IP. In this sense, the provider is free to elect the most suited alternative for registration without any interference or approval from ESA. However, a safeguarding clause for the IP is set for the cases in which the provider does not ensure proper registration formalities. In this particular case, ESA may unilaterally decide to ensure protection as it considers necessary. Moreover, the wording of Clause 40 and Clause 54 suggests that under ESA practices there is a clear distinction between the law governing the agreement and the law governing the creative activity. This would imply that from a private international law perspective, a connecting factor for determining the applicable law of the creative activity would be: (1) the performance of the agreement by the provider in a given location (i.e., the place of the creator's specific performance) and (2) the parties' agreement regarding the applicable law as stipulated under their contract. Also, for cases in which the creator does not intend to protect the work, ESA is free to assess whether it is relevant for its activity to obtain protection for the respective work. In this

specific case, ESA would be entitled to elect the state of protection taking into consideration the governing law of the agreement.

In light of the above, the principles laid down by ESA Rules ensure the clear determination of applicable law, but only in relation to matters that are directly linked with an agreement concluded by ESA with a third-party partner. This would entail that in cases where the work is not a direct result or even derivative of the agreement the general rules mentioned under the sections above would be applicable.

E. Distinction between Res Communis Principle Provided under the Space Treaties and the Creation of Works in Off-World Environments

The fundamental basis for international space law is the series of treaties negotiated and created by the United Nation's Committee on the Peaceful Uses of Outer Space (COPUOS).

The Outer Space Treaty regulates under Article II the principle of non-appropriation of outer space by any country. This is also linked with the manner in which state sovereignty is regarded from an international law perspective as being limited to the airspace above the respective national territory, without, however, the setting of an express limit of the airspace. Moreover, a clear distinction should be made between outer space and an object that is launched in outer space.

As far as an object launched into outer space is concerned, in accordance with Article VIII of the Outer Space Treaty, the state on whose registry such an object is carried shall retain jurisdiction and control over that said object, and over any personnel thereof.

In the implementation of this principle, the Registration Convention defines the notion of *launching State*, which is a State that launches or procures the launching of a space object or a State from whose territory or facility a space object is launched. The launching state should ensure the registration of the space object in an appropriate registry. Furthermore, the Registration Convention expressly details the case in which there are two or more launching states. In this case, the launching states should determine which one should register the object, without prejudice to appropriate agreements concluded among the launching states on jurisdiction and control over the space object and over any personnel thereof. Therefore, according to International Space Law, the country of registry retains jurisdiction and control over the space object and over any personnel thereof unless otherwise agreed among the launching states. Consequently, it follows that the jurisdiction and control over the space object and its personnel is determined by the nationality (registering state) of the space object. In this context, the question that arises is whether the territorial jurisdiction under IP law allows the extension of each national (and regional) law to the objects which the respective country has registered and launched into outer space. Furthermore, an additional distinction should be made between activities carried out in outer space and activities relating to outer space which are carried out on the territory of a country or on the territories of several countries.

Based on the general principle of territoriality of IPRs, the acquisition and enforcement of IPRs related to creative works which were made in outer space but which are used in one or more territories on Earth are, in general, governed by the national (or regional) IP law of the country or countries concerned based on the rules mentioned above under this section. Therefore, a separate consideration as to the applicability of general IP rules may be needed only with regard to activities that are carried out in outer space, regardless of the environment in which the creative work was developed [15]. From this perspective, the qualification of the outer space as a *res communis* [16] impedes territorial sovereignty in space of any country and therefore the exercise by any country of its territorial jurisdiction over off-world activities, including exploitation of IP. Moreover, even in the case of recognizing an extra-territorial right of the launching state with respect to the space object, a question that may be raised is regarding the activities carried out in outer space (e.g., space walks etc.) or on other celestial bodies, including in regions that are not construed as part of the research base.

Taking into account the current legal provisions applicable to ESA it may be regarded that these questions have not a clear-cut solution. In this regard, under Orientations on the European contribution in establishing key principles for the global space economy [17], the Council of the European Union has emphasized the importance of IP in the expansion of space related activities, however without any further detail related to the manner in which the legislative framework would need to adapt.

III. Ownership over IP Created by Third Party Providers of ESA

A. General Rules Regarding Ownership

In lack of an express legal framework governing IP matters related to space activities, ESA has approved and implemented a series of general contractual clauses that ensure a substantial characterization of the rights and obligations of each party. Thus, as a general principle, ESA's approach regarding the ownership over IP created by third party providers is that all ownership rights remain with the provider. Moreover, taking into consideration the status of ESA as intergovernmental organization, all rights that are bestowed and recognized to ESA are also applicable in full to all Member States, without any possibility to limit such use by the provider, excepting the case in which the creative work is still pending the publication of its corresponding patent application. However, this limitation is only recognized for a restricted period of time of 12 months.

In addition to the above, Clause 41 under ESA Rules establishes that the license granted to ESA and its Member States is an irrevocable worldwide license which should be ensured even in cases where the IP is assigned to third parties.

B. Use of Background IP

ESA Rules establish that background IP include all IPRs which were not developed based on the agreement concluded with the Agency either prior to or during execution of the agreement and which are used by the provider and/or the

Agency to complete the contract or required for use of any product, application or result of the contract.

A preliminary stage in the negotiation process of any agreement concluded with ESA is the identification by the provider of any background IPRs which are related to the performance of the agreement and provision of related details in this regard. This exercise is required given that a clear carving-out of the IP developed under the agreement is necessary in order to establish the types of licensing rights granted to ESA (including the possibility to register such IP in cases where the provider expressly waives this right). Moreover, in lack of such identification, ESA Rules contain a general presumption that all IPRs used during the execution of the agreement are arising from work performed under the contract.

The general rule regarding ownership over background IPRs is that the provider or the third party will remain the owning party over such rights. In addition, if ESA requires any background IPRs owned by the provider, the latter will grant the Agency an irrevocable, free, worldwide license to enable the Agency to use and modify any product, application or result of the agreement for that project.

C. Clauses Regarding Software Development

ESA Rules regulate separately the matter of software developments arising from work performed under the agreement. In this sense, the general rule regarding ownership is that the provider is the owner over the IPRs embedded in the software, while ESA is granted with a right of use. Moreover, the provider is required to supply to the Agency alongside with the developed software all information, data and documentation as well as all background IPRs necessary for ESA to operate the software in accordance with the license. The license right implies also that the provider will ensure the installation of the software on the hardware specified by ESA and provide training to persons that are envisaged to operate the software.

IV. Treatment of Creative Works developed by Staff, Fellows or Experts of ESA

The matter of creative works developed by staff, fellows or experts at ESA is detailed under the Rules on Information, Data and Intellectual Property and the Staff Regulation and Rules [18].

Both Regulations define IP in the widest sense acceptable under law, including not only inventions that can be protected by patents or similar forms of legal protection, but also registerable designs and copyright material as well as technical and scientific improvements and discoveries.

The general rule in this case is that the ownership right over any creative works produced by a staff member, fellow or expert of ESA (1) within the scope of his duties or (2) by using the technical and administrative facilities of ESA or (3) or which is substantially based on experience or work of the Agency, are owned by ESA. Given that astronauts are regarded as ESA staff members it results that, in principle, all works developed in off-world environments and which are circumscribed to the professional activity of the astronaut is held in property by ESA. This rule is not extended to any creations that exceed the professional activity of the astronaut, e.g., painting/drawings or other similar activities, irrespective of the creative environment, including outer space.

Rule 4.2/3 under the Staff Regulation and Rules establishes an important limitation regarding ownership rights over IP applicable only to staff members providing that a staff member may be required to relinquish their IPRs if there is an incompatibility with employment in the Agency.

V. De lege Ferenda Proposals

Taking into account the effervescence of space exploration in the last decade and the fact that the number of creative works developed in relation to space activities has increased dramatically (as indicated in the 2021 and 2020 Patent insight reviews of the European Patent Office [19]), the systematization of a new legal framework regulating the matter of IP specifically in relation to space exploration should be adopted at the international level.

States should take coherent steps in the process of harmonization and integration of national laws into a consolidated system of rules that would enable a clearer application of the legal provisions regarding IP, mainly with regard to the creative works used or developed in outer space. In this sense, the most suited alternative for a *de lege ferenda* proposal would be the adoption of an international treaty that would be regulated as a self-executing body of rules, without any need of further implementation or naturalization of its provisions into local legislation.

VI. Conclusion

The current legal provisions regulating the matter of IP at the international and EU level are based on the territoriality principle of registration and ownership of IPRs. This principle is however difficult to reconcile with the International Space Treaties that regard the outer space as a common space for humanity, not subject to any appropriation or territorial sovereignty. In this context, ESA has laid down a series of general contractual terms and principles that are intended to be a starting point for negotiation and contractual regulation of issues regarding IP with providers. However, questions may arise from the fact that most legal rules governing creative activities developed in the outer space or related to space activities are regulated contractually without the existence of a specific legal framework in this respect.

In order to ensure a coherent approach to IP matters related to space exploration, states should take into consideration the adoption of a new treaty that would regulate separately the exploitation of IP in off-world environments.

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