

Owning the Hosted Payload and International Space Law

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Abstract

This article deals the issues concerning the hosted payload under international space law. To understand the hosted payload projects, the types of the contracts for such projects are discussed, but the harmonization between the risk allocation of the parties concerned and liability issues for damage caused by the hosted payload is mainly studied.

The hosted payload satellite is said to be the one that the main owner of the satellite spares some space on it for the other party. The details of the projects can be agreed between the parties depending on the projects. Such details are mostly confidential, but the author tries to show the types of collaboration by using the actual examples.

As the hosted payload satellite has more than two parties that have interests in the satellite, it is very important to agree in advance how to allocate the risks between the parties. On this, especially for the projects between the non-governmental entities, the indemnification against the damage of the third parties caused by such satellite should be included. Notwithstanding such allocation, since the damage from the space activities may become enormous and the financial ability of the non-governmental entities may be limited, the State should be the final bearer of the liability against victims as international space law has in mind.

Under international space law, the launching State is liable for the damage caused by space activities. The definition of the launching State under international space law could be found in the Liability Convention or the Registration Convention. When the hosted payload project is driven by the non-governmental entities, the identification of the launching State becomes difficult; such definition involves States, and makes it difficult to determine the launching State for activities of the non-governmental entities. As international space law has focused on the protection of the victims, the relief of the victims of the hosted payload projects should be dealt accordingly. In this respect, it would be ideal that the owner or the operator of the hosted payload (or the State which such owner or operator belongs to) should be regarded as the launching State. Through the discussion at UNCOPUOS or the changes found in the State liability under general international law, the possibility to include such party as the launching State is to be examined.

Keywords: the hosted payload, the launching State, space law, liability.

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1. Introduction

The projects called Hosted Payload (the “HP”) become very popular. These projects are often used because they allow easier access to outer space compared to owning the whole satellites. The HP projects involve more parties than usual satellite procurement projects, therefore, it is recognized that having good contract terms is important. Compared to this recognition, issues of international space law concerning the HP have been paid little attention. Severe damage may be caused by space activities, therefore, it is strongly recommended to agree on the allocation of the liability between the parties in respect of international space law.

Having in mind such situation, this article deals the HP projects in respect of (i) the definition and an overview of the HP projects, (ii) the types of the HP projects and (iii) issues concerning the HP under international space law.

2. The types of cooperation

First of all, what is the HP? To assess and properly apportion the risks between the parties, understanding the details of the HP is unavoidable. In this regards, there is a similar concept of procurement called “condosat”. By comparing the condosat project, the details of the HP is going to be reviewed. There is no clear or agreed definition of the HP or the condosat, however, these can be mostly defined that both the HP and the condosat are the concepts of procurement that several parties have interests in one satellite. It is said that the satellite bus of the condosat, on one hand, is co-owned by the parties concerned, but for the HP, on the other hand, the bus is owned by the one party (the “Host”), and the Host provides excess power or space on the satellite to the other party (the “Client”) [1]. Depending on the HP projects, the owner of the HP may be same as that of the satellite (the Host), or may be different from the Host. The details of such ownership will be discussed in the later part of this article.

Apart from the definitions above, the only way to know whether one project is the HP or the condosat is to look at the actual contract for the respective projects. For example, the contract regarding APSTAR V satellite between APT SATELLITE COMPANY LIMITED and LORAL ORION, INC. states that “The Common Elements shall be owned jointly by APT and Loral Orion” [2]. This shows that APSTAR V project was a condosat project.

The other similar way to procure satellite with several stakeholders is to set up a joint venture company which owns the satellite. In this case, the parties concerned owned the satellite indirectly by holding the shares of the joint venture company. In this way of procurement, the only one company, the joint venture company, owns the satellite. The issue to be discussed in this article deals the parties who hold the right of the satellite directly. Therefore, such joint venture program will not be analyzed in this article [3].

As a general rule, under the principles of freedom of contracts, the parties can agree how to use or own the satellite. With regard to the condosat project, the concept for owning or using the satellite will be equal between the parties, however, in the HP project contract, the Host seems to have the priority for the majority issues. This is because, compared to the Client, the Host invests more money and bears more risks for such project [4]. On this, the most important thing would be to agree to what extent the Client has the right concerning the HP.

3. Actual Examples

As stated before, the owner of the HP may be same as that of the satellite and may be different from the Host. In this section, by reviewing the actual examples of the HP projects, the author would like to present such differences.

3.1 Anik-F1R satellite

Anik F1R satellite was launched from Kazakhstan on September 5, 2005. This satellite is owned by Canadian satellite operator, Telesat [5]. This satellite has the payload used for the United States' Radio navigation Satellite Service (RNSS). This payload has compatibility with GPS and operated for Wide Area Augmentation Service for the United States' Federal Aviation Association (FAA) [6].

In this project, the satellite is owned by Telesat and also Telesat owns the HP. The American company, Lockheed Martin, leases such HP for providing service to FAA. Telesat provides certain services for Lockheed Martin with the direction and control by Lockheed Martin [7]. This satellite is registered by the United States, and, in the registration, there is no mention of the HP [8].

Therefore, in Anik F1R case, the service provider for the customer does not own the HP, and it utilizes and controls the HP by leasing.

3.2 Intelsat 22 satellite

Intelsat 22 satellite was launch from Kazakhstan on March 25, 2012 [9]. This satellite is owned by Intelsat. This satellite has been loaded UHF payload as the HP, which is owned and operated by the Australian Defense Force (ADF) [10]. By the letter from ADF which is attached to the letter of authorization from the United States' Federal Communications Commission (FCC) to Intelsat, Intelsat 22 satellite will be registered by the United States [11] and it is so registered by the United States [12].

From these facts, the satellite is owned by Intelsat, but the portion of the satellite, the HP, is owned and operated by the other party, ADF.

3.3 Example of Japan

The Japanese Ministry of Defense has been conducting the procurement and the operation of the X-band satellite as the Private Finance Initiative (PFI) project. It is stated in the explanation documents for the bid that the bidder may propose to load its own payload for X-band satellite which will be owned by the Japanese Government [13].

Above three examples are summarized in table 1.

Table 1 The types of the HP projects

The satellite	Owner of the satellite	Owner of the HP	Bases for HP usage
Anik F1R	Telesat	Telesat	Lease
Intelsat 22	Intelsat	ADF	Ownership
X-band satellite of Japanese Government	Japanese Government	The bidder	Ownership

In case of the HP lease, it should be distinguish from the satellite capacity lease. The satellite communication service provided by the satellite operator is often called “capacity lease” [14]. This is because the satellite service provider focuses on the allocation of some parts of its transponders to provide satellite communication service. The HP lease is different from such capacity lease. The HP lease is not only allowed to use the payload but also providing with the ability to control the HP, as can be shown by the Anik F1R case.

4. Lease vs. Ownership

The examination of the actual examples reveals that there are two types of forms for the use of HP, lease and ownership. The definitions for the lease and the ownership may differ depending on the governing law which applies to the transactions, however, the author would like to study those concept as follows. Referring to the US dictionary, the ownership means “the bundle of rights allowing one to use, manage and enjoy property, including the right to convey it to other [15]”. The meaning of the ownership is almost the same under the Civil Law system [16]. As in the Outer Space Treaty (OST), it is stated that the ownership of the space object shall not be affected by its presence in outer space [17], however, it does not mention the meaning or the contents of the ownership. The lease means “a concept by which a rightful possessor of personal property conveys the right to use that property in exchange for consideration [18]”. Japanese law has almost the same

definition for the lease [19]. In sum, there may be slightly different definition depending on the governing law, but the lease is the contracts that the actual owner allows the other party to use its property.

On this, the “financial lease” should be distinguished from this lease. The Financial lease emphasizes on the aspects of “financing”; it is the form of contract that allows the use of the product by way of financing. The Unidroit Convention on International Financial Leasing [20] defines the financial lease. It states that lessor procures the equipment in connection with the lease agreement [21]. Here, for the financial lease, three parties will be involved, the lessor, the lessee and the product provider (manufacture). First, the lessee decides what it needs and, based on that decision, the lessor enters into the sales contracts with the product provider. Based on such sales contracts, the lessor becomes the owner of such products and leases it to the lessee. Usually, under the basic lease contracts, the lessor is liable for the maintenance of the products because the obligation of the lessor is to provide the product for the use of the lessee. It needs to provide the products eligible for use. On the contrary, under the financial lease agreement, the lessor does not have such obligation; it acts only as the financier [22].

In the Anik F1R case, there seems no financial actor involved for such lease, therefore, it does not fall within the concept of the financial lease.

Then, which form should be adopted for the use of the HP? Of course, it depends of the respective projects, however, both forms have pros and cons.

<p>Mr. Engin Faruk has analyzed this kind of issues in his article [23] for the U.S. Navy’s satellite procurement projects. He has discussed the issues by dividing into three (3) categories; (1) the technical aspect, (2) the managerial aspect, and (3) the financial aspect. Such analysis is also useful for the HP projects. The author would like to summarize the difference between the lease and owning of the HP based on his categorization as in table 2. [table 2] the differences between the lease and the ownership</p>	<p>In case of lease</p>	<p>In case of buying (own)</p>
<p>Technical aspect</p>	<p>The parties agreed on what will be leased.</p>	<p>The parties agreed on the design of the products or the specification of the work.</p>

Managerial aspect	The lessee does not need the capability to manage the procurement.	As the buyer, the party needs the ability to manage the procurement activities.
Financial aspect	(i) the monthly payment for the lease is almost the same throughout the term. (ii) the lessee may get the tax benefit.	The payment for the procurement would be “top-heavy”; the buyer has to pay the amount until the ownership transfer.

5. Risk Allocation

In the previous part, it is discussed that the factors to be considered before deciding the types of procurement for the HP projects. Then, it needs to be reviewed what issues should be taken care of in the respective procurement forms because agreeing the risk allocation between the parties would be one of the key elements for the success of the HP projects. The previous works [24] have pointed out several issues to be dealt under the HP project contracts, such as the delay in the delivery date of the HP, the delay or the failure of the launch, the degradation of the satellite bus due to the HP, the damage caused by the HP to the satellite bus, the change of the orbital position during operation, the insurance coverage. The author would like to point out those issues, especially focusing on the differences between the lease and the ownership of the HP.

Table 3 The contract terms for the HP

Types of contract Phase	In case of lease	In case of buying (own)
At the time of contract	The lease contract shall define the content of the lease; what would be leased and how that parts works.	The Client provides the HP to the Host, therefore, the interface conditions between the satellite bus and the HP should be defined.
During manufacturing	N/A	The conditions for the Client’s delay in providing the HP should be agreed. During assemble phase, the Client may request its approval for the review of the satellite construction.

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Launch	In case of launch failure, the conditions that whether the Client is able to re-lease the same HP or not. In addition, the Host may provide the condition that the lease can be delayed due to launch failure without any liability to the Host.	In case of launch failure, the conditions that whether the Client is able to re-host the HP or not.
During operation	(i) If the lessee is not provided the lease, the conditions for penalty or refund should be defined. (ii) Since the Client has the ability to control the HP, if, due to such control, the Client causes damage to the satellite bus or the primary payload, it would be asked for compensation.	The conditions should be agreed for the case where (i) the HP causes harmful interferences to the satellite bus or primary payload, and (ii) the satellite bus cannot provide adequate power to the HP. This is because the bus or the primary payload would have the priority, therefore, the penalty or refund by the Host may be stipulated in the contract.
Change of the orbital position	If the orbital position is changed, the Client may not use the HP as it intended to be. Therefore, the Client should ask for prior consent for such change.	Same as the lease, if the orbital position is changed, the Client may not use the HP as it intended to be. Therefore, the Client should ask for prior consent for such change.
De-orbit	When the lease period is expired or terminated, the Host can de-orbit without any consent from the lessee.	Due to its ownership to the HP, the Host needs consents from the Client to de-orbit the satellite.

From the studies above, the terms and conditions for the HP projects may vary depending on the types of contracts. The contracts should be carefully

examined taking into the consideration the relationships with the other contracting party, the timing, the cost and so on.

6. Hosted Payload under international space law

In this section, the use of the HP, based on irrespective of ownership or lease, under international space law should be examined. The examination primarily focuses on the issue on the liability of the launching State. On this, if the Client belongs to the same State as the Host, the issue of the launching State will not arise. This is because, under international space law, only the State, not the non-governmental entities, is responsible and liable for the space activities. The attention should be paid to the case where the Host and the Client belongs to the different State. Of course, the victims of the HP projects are protected because there is always the liable launching State, the Host (or the State which it belongs). Notwithstanding the foregoing, it would be an ideal situation if the Client becomes the launching State. This is supported by two factors; the increase of the liable launching State makes easier for the relief of victims and, since the Client actively involved in space activities, it should bear the same liability as the Host.

Based on the examples previously discussed, there seems to be four categories when it comes to the actors of the HP activities. All four categories are based on the assumption that the Host and the Client belong to the different State.

- (1) the State (government) is the Client and owns the HP
- (2) the non-governmental entity is the Client and owns the HP
- (3) the State (government) is the lessee of the HP, and controls the HP
- (4) the non-governmental entity is the lessee of the HP, and controls the HP

First of all, in case of (1) and (2) should be reviewed. Under the Liability Convention [25] and the Registration Convention [26], it is defined that the term space object includes component parts of a space object as well as its launch vehicle and parts thereof [27]. The HP is a component part of the satellite, therefore, the HP should be regarded as the space object. On this, there is no difference for the liability whether owning the whole satellite or owning part of the satellite, the HP. The owner of the HP (or in case the owner is the non-governmental entity, the State which it belongs to) would be regarded as the launching State, even if such owner is not the party to the launch services agreement by the following reasons. In case of (1), it falls within the original concept of the definition of the launching State, the State which procures the launch. And in case of (2), it is arguable that the State to which such Client belongs may become the launching State. The criterion for the State which procures the launch is still vague [28]. Originally, it has meant the State which officially asks the other State to launch the space objects [29]. However, the tendency is found that the State to which the

owner of the satellite (the non-governmental entity) belongs usually register such satellite. By registering the satellite, the State of registry recognizes itself as the launching State, the State which procures the launch [30]. Also, the most influential theory among scholars is to include the State to which the satellite operators belong as the State which procures the launch [31]. Based on these, the concept of the launching State would also apply to the owner of the HP in both cases.

Next, the cases (3) and (4) will be examined. As discussed above, if the Client owns the HP, such HP owner would be deemed as the launching State. In the form of HP lease, the lessee does not own the space objects and the lessee is not the party to the launch service agreement, therefore, it may lead to the conclusion that the State of lessee may not become the launching State and may escape the liability arising from its space activities.

It would be reasonable that the party who is provided satellite communication service will not become the launching State, because such party is just utilizing the communication service. It does not have any ability to control the satellite or part thereof. However, it should be pointed out that the lease of the HP involves the control of the HP. On this, the owner of the satellite does not have any ability to manage or control the HP for not causing damage to third parties. One way to minimize the liability of the owner of the satellite is to agree on the indemnification with the lessee for the damage caused by the HP. Even if the parties agree this indemnification, the damage caused by the space activities may be tremendous. For the non-governmental entities, it may be hard to indemnify all damage, therefore, such indemnification should be supported by the applicable State. Conceptually, it is the ideal situation, but agreeing with the State for such indemnification is time consuming and may affect the project schedule. Then, the possibility of the lessee of the HP to become the launching State should be examined.

6.1 the responsibility of the State under article 6 of the OST

Article 6 of the OST states the State parties shall bear international responsibility for national activities in outer space. Such responsibility includes that the State should conduct space activities in accordance with international law [32]. Of course, if the State violates such provision, the State should be liable, however, such liability arises only when the State has done the wrongful act and such act belongs to the State [33]. Therefore, this responsibility is different from the one under the non-fault base liability under article 7 of the OST or under article 2 of the Liability Convention. Under the study of the International Law Commission, the work has been done concerning the international liability for injurious consequences arising out of acts not prohibited by international law. It tries to incur liability for ultra-hazardous activities on non-fault basis. This work has been criticized because there is no customary international law that the State liability shall

occur due to non-fault base liability [34]. In conclusion, under general international law, it is hard to incur State liability on non-fault basis. If we consider the protection of the victims from the space activities, the non-fault base liability should be maintain and it is desirable that the party which controls the HP should bear the liability of the launching State because by controlling such HP, such party is in the best position to prevent the damage. To regard the controller of the HP as the launching State, the concept of the launching State is to be broadened to include such controller.

6.2 Controls under international space law

Under the OST or the Liability Convention, the ownership of the space object is not the basis for the application of international space law [35]. Rather, article 6 of the OST uses the operation of the space object as the link to impose responsibility of the space activities [36]. As for the return of the space object, article 8 of the OST mentions the State of registry, however, the Rescue Agreement uses the word the “launching authority” [37]. The launching authority is defined as the State responsible for the launch [38], and that definition does not mention any ownership of the space object. In sum, the ownership is not the only criteria for the application of international space law.

6.3 Discussion at UNCOPUOS

The UN General Assembly’s resolutions, “Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects” [39] and “Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space” [40] should be studied because both resolutions mention that relationships between the control of the space object and the party responsible or liable.

Under the former recommendation, it is recommended that the ways to make registration of the space object more effective by requiring States to be in compliance with the Registration Convention and by formalizing the information to be provided to the UN Secretary General. Among the recommendations, in the joint launches of space objects, each space object should be registered in the appropriate registry of the State responsible for the operation of the space object under article 6 of the OST [41]. Here, the original concept for the registration of the space object is under article 7 and 8 of the OST, which deals the concept of the launching State and the registration concept. However, this recommendation request the registration by using the link of responsibility for the national space activities stated in article 6 of the OST. Moreover, the recommendation asks the launch service providers to encourage registration not only by the owner of the space object but also the operator of the space object [42]. In addition to this recommendation, the information, such as the new owner or the new operator, should be provided in case of the change of supervision [43].

In the latter recommendation, it is mentioned that the operation and control of space objects in orbit should be regulated under the national space law [44], and also when the liability of the State arises from its nationals space activities, the State could consider ways of seeking indemnification from not only the owners of the space object but also the operators of the space object [45].

In relation to these recommendations, Mr. Jean-Francois Mayence states “(T)he owner is rather mentioned as an alternative (or an addition) to the identification of the operator as the key-person for the implementation of national space laws” [46].

In conclusion, the recognition of the member States of UNCOPUOS is reflected in these recommendations that the party who controls or operates the space object should become the responsible/liable party for its space activities.

6.4 Changes of State liability under international law

The basis for the concept of the launching State seems the same as that of the State liability under international laws [47]. Therefore, if there is a change in the State liability concept under general international laws, it can be applied to the concept of the launching State.

The words “jurisdiction and control” are originally used under article 8 of the OST [48], however, these days the words “jurisdiction or control” are used in such as the field of the environmental protection. The words “jurisdiction and control” have been recognized that the territorial jurisdiction and the personal jurisdiction which covers the nationals or the vessels and the aircrafts which have the nationality of such State [49]. Recently, however, the concept of “control” is intended to include the “actual control” [50].

The principle No.21 of the Stockholm Declaration [51] provides that the States have “the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of area beyond the limits of national jurisdiction.” This principle broadens the State liability to include the activities under its control, in addition to the activities under its jurisdiction. The use of the words as “jurisdiction or control” was surely “intended to consider both “jurisdiction” or “control” as separate and sufficient bases for triggering the State’s obligation” [52].

In fact, the jurisprudence supports this idea. To include “actual control” to the basis for the State liability is found in the advisory opinion of International Court of Justice [53].

Moreover, some treaties concerning disarmament use the word “jurisdiction or control” to regulate the State liability.

From what has been said, the actual control of the State has become one of the reasons for the State liability to incur. The discussion under the UNCOPUOS also follows this tendency and it is reasonable to interpret the

concept of the launching State to include the State which actually controls the satellite or the HP.

7. Conclusion

From the study in this article, it is revealed that there are several types of the HP projects. To successfully implement the HP projects, understanding the risk and negotiate the terms beforehand is important.

Space activities may cause huge damage to the others. To fully indemnify the victims, non-governmental entities should involve the State to which those entities belong for the appropriation of liability. This can be realized by separate contracts with the State or the change of the interpretation of the concept of the launching State. Even though the State liability under general international law shows the possibility of such interpretation, however, international space law is regarded as *lex specialis*. On this, even though, the new tendency is admitted under general international law, the liability based on control should be admitted within international space law regime. When this is realized, the relief of the victims becomes easier and that would enhance the freedom of the space activities.

References

- [1] Eg., Gerry Oberst, “Models of Ownership: Condominium and Hosted Payload Satellites”, in Mahulena Hofmann and Andreas Loukakis eds., *Ownership of Satellites*, pp.140-141; <https://www.space.commerce.gov/category/government-business/hosted-payloads/> (last accessed December 9, 2018)
- [2] Article 2.4 of Apstar V Condosat Agreement between APT SATELLITE COMPANY LIMITED and LORAL ORION, INC. dated December 10th, 2002. (<https://www.sec.gov/Archives/edgar/data/1029850/000095012303003705/y84834exv10w16.txt>) (last accessed December 9, 2018)).
- [3] For example, the Horizons3e satellite (https://www.sptvjsat.com/load_pdf.php?pTb=t_news_&pRi=410&pJe=2) (last accessed December 9, 2018)
- [4] Of course, the right to be conferred to the Client may differ based on the price and other conditions between the parties.
- [5] ST/SG/SER.E/540 (April 11, 2008), p.2.
- [6] <https://docs.fcc.gov/public/attachments/DA-05-2424A1.pdf> (last accessed December 9, 2018) p.15.
- [7] *ibid.*
- [8] ST/SG/SER.E/540 (April 11, 2008), p.2.
- [9] ST/SG/SER.E/650 (August 1, 2012), p.5.
- [10] Attachment to Grant IBFS File No.SAT-LOA-20110929-00193 Call Sign:S2846 p.1. (<http://licensing.fcc.gov/cgi-bin/ws.exe/prod/ib/forms/>)

- reports/related_filing.hts?f_key=-233699&f_number=SATLOA2011092900193) (last accessed December 9, 2018)
- [11] *Ibid.*, p.5.
- [12] *Supra note 9.*
- [13] The explanations for the bid, 3 (4) (1) the activities concerning the procurement of the satellite (in Japanese) (<http://www.mod.go.jp/j/procurement/xband/materials2/s02.pdf> (last accessed December 9, 2018)).
- [14] E.g. <https://www.intelsatgeneral.com/satellite-bandwidth-services/>; <https://www.asiasat.com/what-we-do/services/satellite-capacity-leasing> (last accessed December 9, 2018)
- [15] Black's Law Dictionary (third pocket edition)
- [16] Noritake Kobayashi, "The ownership under the Common Law" in *Sogohougaku*, Vol. 11 No. 6. (in Japanese) (1963), p.40.
- [17] Article 8 of Outer Space Treaty (the "OST") (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, signed on January 27, 1967, entered into force on October 10, 1967, 610 U.N.T.S. 205.)
- [18] *Supra note 15.*
- [19] Article 601 under Japanese civil code
- [20] Signed on May 28, 1988, entered into force May 1, 1995, 2321 U.N.T.S. 195.
- [21] Article 1, 2 (b) of the Unidroit Convention on International Financial Leasing
- [22] Taichi Kajimura et al., eds., *Contract for Lease* (in Japanese) (1992), pp.3-10.
- [23] Engin, Faruk, "Lease versus buy decision making in the Navy's satellite communications systems.", Naval Postgraduate School Thesis (June, 1989)
- [24] Milton "Skip" Smith and Stephen E. Smith, "Legal Issues Presented by Hosted Payloads", *Proceedings of the International Institute of Space Law* (2012), pp.495-508; Steven Kaufman and Randy Segal, "Hosted Satellite Payload Procurement: A Brief "How-To" Guide (<https://s3.amazonaws.com/documents.jdsupra.com/b30edce3-61a2-4713-be0d-c45811ec04d3.pdf>) (last accessed December 14, 2018); James D. Rendleman, "Brave New World of Hosted Payloads", *Journal of Space Law*, Vol.39 (2013), p.163.
- [25] Convention on International Liability for Damage Caused by Space Objects, signed on March 29, 1972, entered into force on September 1, 1972, 961 U.N.T.S. 187.
- [26] Convention on Registration of Objects Launched into Outer Space, signed on January 14, 1974, entered into force September 15, 1976, 28 U.S.T. 695, T.I.A.S. No. 8480, 1023 U.N.T.S. 15.

- [27] Article 1 (d) of the Liability Convention and Article 1 (b) of the Registration Convention
- [28] Setuko Aoki, “Launching States concept in the ear of commercial space launching”(in Japanese) in *Hogaku kenkyu*, Vol. 75, No.2 (in Japanese) (2002) p.75.
- [29] Fumio Ikeda, *The Theory of Space Law* (in Japanese) (1971), p.223.
- [30] Article 2 of the Registration Convention states that only the launching State registers the space objects.
- [31] Souichiro Kozuka, Masahiko Sato eds., *Introduction to Space Law for Entrepreneurs* (2nd edition) (in Japanese) (2018) p.51.
- [32] Bin Chang, “Launch Activities” in *Studies of International Space law* (1997), pp.608-609.
- [33] Michael Gerhard, “Commentary on Article VI of the OST”, in Stephan Hobe et al. eds., *Colonge Commentary on space law, Vol. 1* (2010), p.116.
- [34] Takane Sugihara, et al., *Lectures on Modern International Law* (5th edition) (2015) (in Japanese) p.372
- [35] Jean-Francois Mayence, “The Relevance of the Concept of ‘Ownership’ in Space Activities and their Regulation, in Mahulena Hofmann and Andreas Loukakis eds., *Ownership of Satellite* (2017), pp47-48.
- [36] Armel Kerrest, “Legal Aspects if Transfer of Ownership and Transfer of Activities”, in Mahulena Hofmann and Andreas Loukakis eds., *Ownership of Satellite* (2017), p.76.
- [37] Article 4 and 5 of the Rescue Agreement (“Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space”, signed on April 22,1968, entered into force on December 3, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119.)
- [38] Article 6 of the Rescue Agreement
- [39] UN Doc. A/RES/62/101 (January 10, 2008)
- [40] General Assembly Resolutions bearing Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space (A/RES/68/74) (December 11, 2013)
- [41] Recommendation 3(c)
- [42] Recommendation 3(d)
- [43] Recommendation 4
- [44] *Supra note* 40, para 1.
- [45] *Ibid.*, para 7
- [46] *Supra note* 35, p53.
- [47] Akiko Watanabe, “The possible liability of the State which does not fall within the concept of the launching State”, in *Proceedings of the International Institute of Space Law* (2016), pp.144-145.
- [48] *Supra note* 36, p.69.
- [49] Chiyuki Mizukami et al. eds., *International Environmental Law* (in Japanese) (2001), p.241.

- [50] Shinya Murase, “State Responsibility for Control of Multinational Enterprises in International Environmental Law”, *Journal of International Law and Diplomacy* Vol.93 (3-4) (in Japanese) (1994), p.151.
- [51] Declaration of the United Nations Conference on the Human Environment (U.N. Doc. A/CONF.48/14/Rev.1)
- [52] Francesco Francioni, “Exporting Environmental Hazard through Multinational Enterprises: Can the State of Origin be Held Responsible?” in Francesco Francioni and Tullio Scovazzi eds., *International Responsibility for Environmental Harm* (1991), p.289.
- [53] LEGAL CONSEQUENCES FOR STATES OF THE CONTINUED PRESENCE OF SOUTH AFRICA IN NAMIBIA (SOUTH WEST AFRICA) NOTWITHSTANDING SECURITY COUNCIL RESOLUTION 276 (1970) ADVISORY OPINION OF 21 JUNE 1971