

Proposal of Governmental Compensation for Damages in Orbital Activities Especially for Space Debris Removal

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Abstract

My paper advocates for the creation of a legal policy aimed at accelerating the initiation of the “Space Debris Removal Business” as quickly as possible. This policy is focused on government compensation for situations where the damage in outer space exceeds an insured amount. The policy will cover any damage derived from active orbital services, including Space Debris Removal.

There is a common understanding across the globe that Space Debris Remediation is becoming necessary to keep space activities safe and sustainable. It would be ideal if a core set of laws were applicable to all nations. However, because Space Debris is increasing rapidly, we cannot wait for the formulation of international standards.

Therefore, I would like to propose a measure to minimize the barriers of entry into the “Space Debris Removal Business,” which features a compulsory insurance and governmental compensation system (by referring the system in the field of rocket launch) to encourage private companies to conduct Space Debris Removal as a part of their core businesses.

To sum up, until the moment an international rule is established, each country should proceed in haste to implement legislation for eliminating space debris. As industrial technologies develop, I expect to see more nations voluntarily remove broken satellites as well as upper stages of rockets that they themselves launched. I hope to support a burgeoning international debate on this issue.

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1. Introduction

It goes without saying that the subject of space debris has been an international issue. Spacecrafts or upper parts of rocket, which have completed their missions and operations, are floating around in orbit without being removed. Over 23,000 of space debris that are larger than 10cm, which are large enough to be observed from the ground, are said to be confirmed. Those debris are moving around at 7 to 8 meters per second, hence, the severity when those debris collide against satellites and rockets would be extraordinary.

Under those circumstances, in June 2019, in Vienna, the Committee on Peaceful Uses of Outer Space (COPUOS) of UN, during its 62nd session, adopted a preamble and 21 guidelines for the long-term sustainability of outer space activities. These provide guidance on policies and regulatory frameworks for space activities; safety of space operations; international cooperation, capacity-building and awareness; and scientific and technical research and development.

At the same time, the World Economic Forum is trying to promote SSR (Space Sustainability Rating)¹, a rating that applies to satellite operators who are tackling the issue of diminishing space debris. This action is one of the examples for reducing the amount of space debris. Furthermore, the G20 discussed for the first time the framework of this matter. The debates and considerations on the international level are picking up the biggest momentum now.

It would be the most reasonable process if the rules of debris recovery (which state has the overall accountability under what responsibility basis) are put in place as an output through international arrangement and agreement.

However, it will obviously be too late by the time technological development is accelerated only after international rule is established. Hence, the Japan Aerospace Exploration Agency (JAXA), a non-profit Space Agency in Japan, planned the world's first technological proof of the concept of large-sized debris removal² by working with a private business operator. The question then arises as to how the private business operator can make its business profitable after the "CRD2" experiment with JAXA.

From the standpoint as an independent and private lawyer, I would like to propose a legislative system that may become a breakthrough for the space debris removal business to be successful.

1 <https://www.weforum.org/communities/the-future-ofspace-technologies>.

2 Known as CRD2 (Commercial Removal of Debris Demonstration) <http://www.kenkai.jaxa.jp/research/debris/crd2/crd2.html> (Japanese Website Only).

2. Business Scheme of Space Debris Removal

2.1. Large-sized debris removal for government

Even if Space Debris is recognized as “garbage in space,” a third party cannot eliminate debris on their own. (I will not elaborate on the details of discussion related to international law since it is not the main subject here.) Therefore, the below are possible means to tackle this matter.

The issue could possibly be treated as a national project (public fund) to voluntarily remove large-sized debris such as the upper part of a rocket (if it is apparent as to “which state” had produced such debris). If this service can technologically be established, front-runner nations in the space business are expected to follow and large-sized debris removal may be conducted as a “De facto standard.” At the same time, if JAXA and private enterprises can technologically establish “Active Debris Removal (ADR)” from the experiment relating to CRD2, Japan may be able to export such technology and/or related products to other countries as an ADR business.

2.2. Recovering constellation satellite

The next consideration is as to the feasibility of whether the business can be led by private business operators.

As for the constellation service for which planning is underway, the necessity of operators who can deorbit broken small-sized satellites is considered. In other words, business operators obtaining fees from constellation servicers, who can capture small-sized satellites in outer space and transact to either bring it to another orbit or rush into the atmosphere, are needed.

3. What would be the biggest risk?

On the assumption that the technological development for doing business is penetrated, and that the price comes to terms with the customer, what would be the most significant risk pertaining to this business? The biggest, as well as the sole risk, that is associated with a space industry operated by private enterprises is an indemnity risk when an unexpected accident occurs. Such anticipated accidents are as follows;

3.1. The case when a third party's satellite is destroyed

This is a case where a third party's aerospace instrument is destroyed due to the off tracking of the orbit of a satellite when conducting debris removal or the collision with another satellite prior to the time of atmospheric entry.

In this case, the accident may not only lead to the collapse of the satellite that is hit by the debris removal satellite, but it may also cause the discharging of innumerable “new” debris. In the worst-case scenario, the accident may result in the orbit being non-reusable.

3.2. The case when the counterparty's satellite is destroyed³

At the same time, there may be the risk of inflicting damage to the space object that was intended to be retrieved. When the subject for retrieval is either debris or a broken small satellite, it can be considered that indemnity will be waived due to privity of contract. However, when a request by a customer is intended to not recover space debris, but for orbital services such as refueling or remodeling, the exemption from indemnity of damaging the satellite would be difficult to imagine.

Incidentally, there is an assertion that present private insurance can cover indemnity risks when conducting space debris removal operations. It can be considered that the assertion is based on the fact that insurance coverage for TPL of stationary satellite in space is already available now. However, on-orbiting services that include space debris removal is significantly different from a stationary satellite in terms of the satellite being proactively "on the move." Since the actual service is yet to be implemented, and the severity of an accident is unknown, we can presume that the insurance sector is not fully prepared to underwrite the risk. (i.e., the maximum amount of insurance that can be offered, the appropriate insurance rate, etc.)

To put it simply, even if the operation of the orbiting service can be covered by insurance, the premium for the coverage can be assumed to be significant. At the same time, it would be difficult to predict the appropriate Maximum Probable Loss. How can this be overcome?

4. A legislative proposal to resolve the abovementioned issue

In Japan, the Space Activities Act, the law that governs the permissions of a launch, was established in 2016. Either an amendment of this act or an institution of new law would suffice, but could a compulsory insurance and a compensation system run by the government be introduced to resolve the issue? At the moment, both in Western countries as well as in Japan, a compulsory insurance and a governmental compensation system that covers against third party liability for rocket launches have been operated under the Space Activities Act.

In detail, as for the on-orbit activities that are more active such as space debris removal, the competent authority should designate the specific on-orbit services that require compulsory insurance.

If the mission is covered by compulsory insurance, then the amount exceeding the coverage of compulsory insurance will be reimbursed by governmental compensation, as long as the accident occurs in orbit.

Some of the points will be examined below.

3 Regarding debris removal contract, I referred to the following Japanese paper. Souichirou Kozuka, "Addressing risks arising from space debris," 75-3, Non-life insurance research publisher (2013).

4.1. **Would “all” on-orbit activities be subject to this scheme?**

The proposal does not intend to include all on-orbit activities. That is, static satellites should continue purchasing insurance through on-orbit satellite insurance, as the potentiality of an accident is relatively low. At the same time, satellite operators who run ultra-small satellites should also be excluded from the system due to the financial burden imposed.

To further continue this approach, I segmented into 4 types of behavioral patterns of satellites that are proactively “on the move,” which are different from the normal satellites that are going around in orbit.

- (a) The act of contacting such as Rendezvous Docking conducted by ISS.
- (b) The act of contacting to a space object that has a marker and/or interface.
- (c) The act of contacting to a space object that does not have a marker or interface but is recognizable in shape (such as the upper part of rocket).
- (d) The act of contacting to a space object that is unrecognizable in shape.

I initially considered treating (a) to (c) as “orbiting services,” establishing safety standards for each of behavioral patterns respectively and introducing governmental compensation by making it compulsory to cover the damage when an accident occurs during the provision of an on-orbiting service. (However, (c) may be excluded from this scheme. Until the technological development is fully established, (c) can be led by the government for the time being.) Given this design, it would be unnecessary to include small research satellites made by educational institutions or stationary satellites in the system. On the other hand, the promotion of market penetration by private business enterprises into the orbiting service can be expected. In the future, as the technology advances, it will be possible to expand the control of satellites that are subject to compulsory insurance and government compensation.

However, even as “1 to 4 schemes” have been confirmed that the level of complexity and feasibility of operation elevates incrementally, it is still unclear as to the correlation between the probability of an accident occurrence and each respective behavioral pattern. Hence, I would add my proposal to allow orbiting services to be delegated to a Cabinet Office Ordinance upon stipulating considering factors, so that the service (which are subject to governmental compensation) can be supported individually.

Given this circumstance, we can consider permitting satellite operators to Opt-out, which means allowing operators to possess choices. However, if multiple companies do not utilize the scheme, that will imply the unnecessary

of legislation, thus, a determination not by the form of a selection system but by some form of established standards should be established.

In the first place, space debris removal itself is a business that promotes sustainability of space utilization. Therefore, we may limit the scope of governmental compensation by specifying satellite management as “satellite control which is intended for promoting public benefits.”

In other words, only the “on-orbit services” that the country wants to nurture as an industry, such as “Active Space Debris Removal” as a typical example, are identified, and compulsory insurance is imposed only on those selected “on-orbit services.” I believe that it is appropriate to grant government compensation on the condition of compulsory insurance.

4.2. Consideration regarding behaviors that can be exempted from obligation

Shortly hereafter, the constellation era—the situation in which a constellation operator and a client make a contract and conduct removal of broken small satellite or space debris—will arrive. In such case, the contract is expected to include a disclaimer regarding damages to the client’s space objects. If the incident does not have a negative influence on orbit-related issues, the conflict could be resolved by the disclaimer preliminarily agreed between the two parties. However, the possibility of an unexpected occurrence of an accident cannot be ruled out. Even under full measurement and adequate control, no one can assure that those small satellites and debris can be safely captured and taken to other orbits and/or rushed into the atmosphere without causing any accidents. Hence, the proposed system will come into effect specifically for the case where one side of the parties denies the inclusion of a disclaimer.

To begin with, can a disclaimer be included at all times? If the object of removal is a “broken” piece of satellite owned by a constellation operator, the exemption of responsibility can easily be expected, even if the removal of the object fails and it is further damaged. The same circumstance is anticipated when the government is a client and it asks for debris removal such as of the upper part of a rocket. However, as for the orbiting service that is intended for refueling, the objective cannot be attained if the targeted satellite is destroyed. From a constellation operator’s standpoint, it is hard to believe that the other undamaged satellite will be waived from responsibility. Therefore, by limiting the scope to the damage occurring to third party and based on the definition of “loss,” it is recommended to exclude “Damage caused to the other party” and not include that in governmental compensation.

4.3. The difference of Third-Party Liability against general rocket launching

In the Japanese Space Activities Act⁴⁵, as to the general rocket launching, Third-Party Liability that occurs on the ground is recognized as “no-fault responsibility” and accountability is converged into the rocket launcher instead. However, since the damage caused by on-orbit activities is recognized as an “accident in space,” negligence liability will be adopted, and the PL method will be excluded by harmonizing with “the Convention on the International Liability for Damage Caused by Space Objects.”

Although it is fully conceivable to introduce no-fault liability here, it seems difficult at this stage to accept no-fault liability without compromising international law. On the other hand, adopting the responsibility for negligence will require the burden of proving “negligence,” but if the discussion of STM (Space Traffic Management) matures or SSA technology improves in the future, it will gradually be resolved.

4.4. Identification of the extent of the damage

Activities newly selected as orbital activities that are subject to government compensation under my proposed system will cause damage not only in space, but also on the ground in the unlikely event such as of the removed satellite fragments falling to the ground. If such damage is caused on the ground by selected “on-orbit services,” they should be subject to government compensation as well. Although the current Japanese Space Activities Act does not cover damage on the ground caused by on-orbit activities by government compensation, it is preferable to expand it.

On the other hand, if the related damage such as communication failure spreads on the ground due to damage in outer space, it is desirable to remove this so that the damage does not spread indefinitely.

4.5. Mission permission system

Japan's Space Activity Act does not have a so-called “mission permission system” that gives approval for launching satellites. However, if government compensation is provided for some of the orbital activities, mainly for public interest or industrial promotion, I think it will be desirable for both the business and the reviewer to give the mission permission to launch the satellite.

4 The accurate name of this law is “Act on Launching of Spacecraft, etc. and Control of Spacecraft” (Act No.76 of 2016).

5 Souichirou Kozuka, “Strict Liability and State Indemnification under Japanese Law. The New Space Activities Act Compared with the Scheme on Compensation for Nuclear Damages,” Bd. 22 Nr. 43 (2017) *ZJAPANR* <https://www.zjapanr.de/index.php/zjapanr/article/view/1124>.

5. Concrete Provisions

The proposed provision is already drafted. By incorporating it as Japanese domestic law, I believe that there is a chance for Japan to become an advanced nation in on-orbit services including space debris removal. But at the same time, I am hoping that a similar system will become available in every nation and that the system becomes a De facto standard where debris are voluntarily collected by the nation or the enterprise who carries the responsibility of discharging the debris.

The structure of the provision is as follows:

- A: Purpose
- B: Definition
- C: Requirements for permission regarding control of spacecraft
- D: Compensation for damages
- E: Responsibility
 - E-1: Responsibility for negligence
 - E-2: Non-application of Product Liability Act
 - E-3: Comparative fault
 - E-4: Right to compensation
- F: Related rules for payment of insurance claim
- G: Damage Liability Insurance Contract
- H: Damage Liability Indemnification Contract
 - H-1: Term
 - H-2: Indemnification Payment
 - H-3: Limitation on Execution
 - H-4: Prescription
 - H-5: Subrogation
 - H-6: Redemption of Indemnification Payment
 - H-7: Administration of Businesses
 - H-8: Entrustment of Business
- I: Deposit with Official Depository
 - I-1: Deposit as Security Measure for Compensation for Damages
 - I-2: Payment from Deposited Properties
 - I-3: Recovery of Deposited Properties
 - I-4: Delegation to Cabinet Office Order and Ministry of Justice Order

Finally, I would like to refer to the necessity of legislation. (in Japan it is referred to as “Legislative facts.”) For this insight, the important point is to grasp the status and to evaluate the risk of collision.

On this point, we need to recognize that the status is changing every moment due to the progress of SSA technology. At the least, collisions of in-operation satellites have not occurred in recent years, but “nearly” collisions of debris against debris have frequently been confirmed on a frequent basis.⁶ If the debris-on-debris collision does occur, the chance of triggering the Kessler Syndrome would grow rapidly. Considering the necessary time required for legislation, deployment and operation, I would strongly urge that the actions be initiated without wasting any time for legislation and have it ready by 2021, the time we are planning to conduct the world’s largest debris removal proof of contest.

6. Conclusion

There could be many reasons for denying the proposal of the above system, such as there being no need for a government compensation system, a lack of international unified rules, and no victims on the ground. However, if we do not start “active debris removal” in the form of a “earning business” using the power of the private sector right now, it will be “already late.” Which countries will become hungry quick and start to make industrial promotion laws? Depending on the game, the technology for “active debris removal” necessary for space development in the near future will be gathered in a specific country, and the country that is essential for space development will already be decided.

6 George Dvorsky, “U.S. Air Force Warns There’s a Chance an American and Russian Satellite could Collide Overnight,” (2019 September 17th) URL: <https://gizmodo.com/u-s-air-force-warns-anamerican-and-russian-satellite-1838195500>.