International Liability Regime for Damage in Commercial Human Spaceflight: Current Problems and Potential Solutions

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Abstract

While the Outer Space Treaty and Liability Convention establish a liability system that primarily focuses on damage caused by space objects, there is an absence of a specific regime tailored to address the unique characteristics of commercial human spaceflight. Despite various provisions on liability issues found in national space legislation of major space-faring nations, as well as the 1998 IGA and supporting legal documents from commercial space companies' tourism projects, these efforts have not resulted in an internationally recognized damage liability regime for commercial human spaceflight. This lack of a predictable and specific legal system may potentially discourage investment in this industry. Therefore, establishing a foreseeable and stable international liability regime for damages would directly contribute to encouraging active participation from multiple parties in commercial activities within outer space while also fostering greater economic and social benefits, ultimately promoting long-term sustainable development of outer space activities.

Keywords: International liability; commercial human space flight; Liability Convention; private entities.

Despite being in the early stages of development, commercial human spaceflight holds significant potential as an industry for international socio-economic advancement by integrating advanced scientific and technological achievements. Irrespective of whether it is aimed at space tourism, scientific research visits, or other purposes, addressing potential liability challenges

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throughout the entire process remains a crucial hurdle to overcome in advancing the commercialization of human spaceflight. To foster its development, establishing a comprehensive and systematic international liability framework becomes necessary and imperative. The objective behind such a regime is to resolve international liability disputes arising from commercial human spaceflight while encouraging countries to consider the interests of others when exercising their right to explore outer space. Enhancing and constructing an international liability regime for damages resulting from the commercialization of human spaceflight contributes towards its long-term sustainable growth. This paper primarily aims to elucidate provisions on damage liability applicable at both national and international levels concerning the commercialization of human spaceflight, analyze potential dilemmas encountered during improving and constructing an international liability framework for such damages, and propose viable measures to address these predicaments.

1. International Liability Rules of Human Spaceflight

The commercialization of human spaceflight at the international level is regulated by the Outer Space Treaty and the Liability Convention, which determine international liability for damage. Simultaneously, the Intergovernmental Agreement on the International Space Station (hereinafter referred to as the Intergovernmental Agreement), signed in 1998 by parties including the United States, Russia, Canada, Japan, and the European Space Agency, primarily focuses on legal aspects concerning the International Space Station. Within this agreement, liability for damages is governed by rules on cross-exemption from liability.

1.1. Outer Space Treaty

Given that all forms of space activities present a potential threat to all States indiscriminately, the Outer Space Treaty aims to establish a robust framework for international liability by encompassing provisions on damage caused by outer space activities. It holds States accountable for any harm suffered by another State party and seeks to address various claims arising from highly hazardous activities in outer space. Article 6 of the Outer Space Treaty stipulates that each State party shall bear international liability for its actions in outer space, including those conducted by governmental departments as well as non-governmental bodies and organizations. In practical terms, any "activity" related to human exploration and utilization of outer space is generally considered subject to Article 6, such as the act of launching a spacecraft into outer space.[1] Furthermore, Article 7 establishes

1 See Article 6 of the Outer Space Treaty: "Each State Party bears international responsibility for the activities it (whether governmental or non-governmental bodies or organisations) conducts in outer space, including the Moon and other celestial bodies."

comprehensive international liability for damage caused by launched space objects and places this responsibility on both the State conducting or procuring the launch and the State providing the territory or equipment for it. Overall, the provisions concerning international liability for damage within the Outer Space Treaty are characterized by their general nature, generic applicability, and principled approach; they primarily emphasize that only States can be held liable while excluding private entities from being subjects of liability or having recourse rights.

1.2. Liability Convention

In accordance with Article 7 of the Outer Space Treaty, the Liability Convention comprehensively outlines international liability for damage caused by space objects and establishes corresponding international regulations and procedures to ensure prompt and equitable compensation for the affected party. Articles 2 and 3 of the Liability Convention respectively establish absolute liability and liability in cases of negligence, with Article 3 serving as a supplementary provision to address any potential gaps in the application of Article 2. On one hand, when a space object causes damage on Earth's surface or to an airborne aircraft, the launching State bears responsibility; thus, establishing a causal link between the damage and the space object is sufficient to trigger international liability. The absolute nature of this liability cannot be exempted unless part or all of the damage results from intentional acts or gross negligence on behalf of the victim. On another note, if a space object causes damage outside Earth's atmosphere in outer space to another State's space object or individuals/property onboard it, only if there was negligence on part of either the launching State or person responsible for said space object would that State be held liable for damages incurred. A signatory State can invoke provisions within the Liability Convention without exhausting local remedies beforehand while also not preventing other States or injured parties from seeking compensation directly from said launching State.[2]

1.3. Intergovernmental Agreement of International Space Station

The International Space Station is characterized by a limited international audience, and the international liability for damage regime of the Intergovernmental Agreement effectively establishes a system of cross-immunity from liability between all participating States, their agencies, contractors, subcontractors, and any personnel involved in the development, construction, launch, and operation of the Station. Article 17 of the Agreement explicitly states that its provisions on international liability for damage are not inconsistent with liability regimes under international law

2 Diederiks-Verschoor, I.H. Philepina/Kopal, Vladimir, An Introduction to Space Law, (Kluwer Law International, 3rd rev. edn, 2008), p. 33.

and that States are generally liable under the Liability Convention unless exceptions outlined in Article 16 apply. Article 16 allows for a mutual waiver of claims among partner States and related entities arising from damages caused to one party by activities connected to the Space Station; "entities" encompass contractors, subcontractors, users, clients as well as contractors and subcontractors of users and clients at all levels within States parties to this agreement. It should be noted that cross-immunity from liability only applies between Governments and relevant entities since their liability relationship is governed by domestic law. The system of cross-immunity from international liability for damage established by the Intergovernmental Agreement plays an essential role in facilitating cooperation between States and entities involved in operations on the International Space Station. According to this Agreement's terms, an injured party cannot invoke international liability against an injuring party regardless of the nature or extent of damages incurred; consequently absolving them from liabilities resulting from damages caused to another party.[3]

2. Current Problems of International Liability Regime

The current international space treaty system is insufficient to address the rapid growth of space commercialization. In commercial human spaceflight activities, the commercial operator, spacecraft, and crew may belong to different countries, leading to complex issues in international liability for damages where the counterparty is often a third country. Based on existing rules of outer space law and international liability systems, constructing an international liability system for damages in commercial human spaceflight presents several dilemmas: firstly, regarding subject matter, it remains unclear who should be held liable and who can make claims; secondly, with regard to constituent elements, basing liability on negligence alone is not entirely reasonable; thirdly, establishing a uniform standard of international insurance for liability for damages poses challenges; fourthly, optimizing the allocation of liability for damage caused by commercial human spaceflight requires improvement.

2.1. Ambiguity Regarding the Subject of Liability and Claims

The Outer Space Treaty and the Liability Convention were established in response to initial human space exploration, aiming to resolve conflicts between States arising from national space activities. However, these treaties did not anticipate the emergence of private commercial operators and their potential for diverse activities in outer space. In State-led human spaceflight

3 Steven Freeland, "Up, Up and . . . Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space", (2005) 6 Chicago Journal of International Law 1, p. 16.

endeavors, the launching State, the State of registration, and the State of crew nationality typically align under a single entity responsible for spacecraft use and launch, crew selection and training, as well as regulation of human spaceflight activities. Conversely, commercial human spaceflight involves multiple entities at various stages necessitating international cooperation for efficient resource allocation. Therefore, it is important to recognize that existing provisions on responsibility and claims within outer space law should not be considered prescriptive guidelines due to this pluralistic nature.

The drafters of the 1967 Outer Space Treaty did not anticipate the rapid development of commercial human spaceflight involving private entities, which has raised questions about liability for damages from space activities. Article 6 of the treaty establishes that liability for both governmental and non-governmental space activities rests with the State, even if commercial entities dominate and handle all aspects of human spaceflight. The 1972 Liability Convention further clarifies that international liability for damages is borne by the launching state, which includes both the State that launches or procures a space object and the State from whose territory or facility it is launched. In cases of commercial human spaceflight, determining who constitutes as "procuring" launch becomes crucial.[4]

Similarly, Article 9 of the Liability Convention stipulates that only a State may bring a claim for compensation for injury against the launching State through diplomatic channels. This implies that States are the sole legitimate entities to make claims and that no organization or individual has the right to assume responsibility for international damages suffered by another party. However, the treaty does not specify precisely what constitutes a "State." In cases where commercial manned spacecraft sustain damage, multiple launching States may be involved. Outer space law is silent on whether all launching States are legitimate subjects of claims and whether there exist any sequence or conditions for making such claims. Under Article 8 of the Liability Convention, when passengers suffer damage, their respective States can seek compensation from the launching State if certain legal requirements are met. The article does not explicitly refer to an injured person's "nationality," but rather uses "those" to indicate that natural persons referred to in this article have established legal relations with their respective states.

International cooperation projects in commercial human spaceflight involving private entities give rise to a multitude of liability situations, aligning with established principles of outer space law. However, the complex interplay between multiple liable parties and competing rights of claimants poses challenges in determining the legal subject responsible for international

4 Frans von der Dunk, "Passing the Buck to Rogers: International Liability Issues in Private Spaceflight" (2007) 86 College of Law, Faculty Publications 400, p. 411. Law, Faculty Publications 400, p. 411.

liability for damages. The lack of clarity surrounding this issue increases the likelihood of international disputes in outer space activities, thereby amplifying risks and costs associated with commercial human spaceflight and potentially undermining incentives for various commercial spaceflight entities to engage in international collaboration.

2.2. Unreasonableness of Negligence as a Constituent Element of the Exception

In international legal liability regimes, the constituent elements of liability for injurious acts generally encompass attributability to the responsible subject and causation of injurious consequences. The requirement for an internationally wrongful act or subjective negligence is not mandatory, although exceptions exist. Focusing on the Liability Convention in outer space activities, its core objective is to address State liability for damage caused by space objects. Distinguishing between Earth's airspace and outer space, the Liability Convention comprehensively outlines distinct criteria for establishing international liability arising from space object-related harm.[5]

International damage resulting from commercial human spaceflight beyond Earth's surface can be categorized into two types: damage caused by human spacecraft and damage caused by passengers. The former refers to harm inflicted on another state during the operation of a commercial manned spacecraft, such as collisions with orbiting objects. The latter pertains to harm caused by a passenger participating in manned spaceflight activities that interferes with another state's outer space operations due to misconduct in violation of regulations. Establishing international liability for damages in outer space requires demonstrating a state's negligence, which raises two primary questions: first, how to define 'negligence' regarding commercial human spaceflight; second, whether non-state actors' 'negligence' can be attributed to states. Specifically, this involves defining 'fault' concerning states and determining if non-state actors' fault constitutes the fault of a state.

In the context of outer space law, the term 'fault' lacks a specific interpretation and is typically assessed based on the criteria of general international law in theory and practice. General international law offers two distinct criteria for evaluating 'fault', namely express breach of an international obligation and negligence.[6] Regarding 'negligence', as referred to in the drafting process of the Liability Convention, it denotes a State's

5 Bin Cheng, *General Principles of International Law as Applied by International Courts and Tribunals* (University College London, 1987), pp. 218-219.

6 Sompong Sucharitkul, "State Responsibility and International Liability under International Law", (1996) 18 Loyola of Los Angeles International and Comparative Law Review 834, p. 835.

awareness of potential damage.[7] The report by the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) clarifies that due diligence serves as a specific criterion for determining negligence. Adherence to this duty implies that a State has acted reasonably and prudently, with an obligation to make every effort to prevent harm or injury to other States.

2.3. Difficulties in Developing Harmonised Insurance Standards

Commercial human spaceflight conducted by private entities generally exhibits lower technological sophistication compared to government-led human spaceflight and carries a heightened risk of accidents and damages. Despite some pre-launch training, passengers possess less capability than professional astronauts in handling unforeseen incidents and mitigating potential harm. In the event of international damage caused by commercial human spaceflight, the absence of insurance coverage may expose passengers to personal liability while subjecting commercial operators to tort claims, potentially leading to their bankruptcy. Although Article 7 of the Outer Space Treaty and Articles 2 and 3 of the Liability Convention impose international liability on the respective State for damages arising from outer space activities, such liability is only enforceable upon a claim made by the affected State. Without a request from the State concerned, injured parties are unable to seek compensation, thereby hindering long-term sustainable development within commercial human spaceflight. The inclusion of commercial insurance can significantly contribute towards cost control in commercial space ventures while alleviating the burden associated with international liability for damages.[8]

Commercial insurance is not uncommon in the field of outer space activities and generally comprises two primary types: space object insurance and liability insurance. For commercial human spaceflight, the Commercial Space Launch Act of the United States mandates a minimum level of liability insurance to be determined by the Secretary of Transportation, in consultation with the Attorney General. It also requires commercial operators to procure a statutory amount of third-party liability insurance prior to engaging in outer space activities, ensuring compensation for damages caused by such activities. The development of national laws pertaining to insurance and liability by States fills a gap in outer space law; however, it does not alter their international responsibilities and obligations under the Outer Space Treaty and Liability Convention. Relying solely on domestic laws to establish an insurance regime inevitably leads to disparate standards among States, resulting in varying obligations for parties causing damage as well as

7 Stanley Mazaroff, 'Exonerations from liability for Damage Caused by Space Activities', (1968) 54 Cornell Law Review 71, p. 90.

8 Ruwantissa Abeyratne, "Synergies and Problems in Outer Space Insurance and Air Transport Insurance", (2003) 30 *Journal Traffic & Transportation* 189, pp. 191-194.

considerable differences in compensation received by injured parties experiencing similar damages.[9]

If a uniform international standard for liability insurance for damage in outer space is to be developed, it must take into account the varying economic levels of countries. Even if only minimum limits of insurance are set at the international level, the differing levels of development in both the commercial human spaceflight industry and insurance industry across different countries will result in high insurance costs being passed on to passengers, leading to an unreasonable cost of commercial human spaceflight that hinders its healthy development.[10] Although early-stage participants in commercial human spaceflight usually have sufficient financial resources to support themselves, limited insurance coverage and unlimited risks associated with space activities may lead to unaffordable and unfavorable consequences. As a result, reaching an agreement on standards beyond objective limitations based on economic level is difficult for the international community. Secondly, when formulating uniform international rules and standards for space liability insurance, negotiations between insurers and national or commercial operators are key factors. For insurers, profit-making is always their primary goal while risk assessment determines whether they choose to participate in commercial human spaceflight insurance.

2.4. The Problems of the System for Allocating Responsibility for Causing Damage

Both the Outer Space Treaty and the Liability Convention establish provisions for holding States accountable for damages resulting from governmental and non-governmental space activities, acknowledging that early human space endeavors were primarily led by States. To alleviate the burden on States in assuming sole responsibility, certain spacefaring nations have additionally assigned liability through domestic legislation. An international framework addressing damage liability should not only determine who bears responsibility and to whom it should be attributed but also consider the distribution of responsibility among different entities involved. Given that commercial human spaceflight involves a broader range of stakeholders with commercial operators at its core, it is imperative to clarify the allocation scheme for liability in case of damages.[11]

9 Peter D. Nesgos, "The Challenges Facing the Private Practitioner: Liability and Insurance Issues in Commercial Space Transportation", (1989) 4 Journal of Law & Technology 21, pp. 25-26, (1989) 4 *Journal of Law & Technology* 21, pp. 25-26.

10 Richard Gimblett, "Space Insurance into the Next Millennium", in *Outlook on Space Law Over the Next 30 Years: Essays Published for the 30th Anniversary of The Outer Space Treaty* (Gabriel Lafferranderie & Daphne Crowther eds., 1997), p. 168.

11 See Patrick Collins, "The Regulatory Reform Agenda for the Era of Passenger Space Transportation", (1993) 20 *ISTS Proceeding*, Paper No. 956-f-13.

In the context of cooperative commercial human spaceflight projects involving multiple States and private entities, there can be various causes of damage, multiple liable States, and situations where States have varying degrees of involvement in and regulation of commercial human spaceflight activities. If the existing provisions of outer space law were to be adhered to at the international level, States would bear liability for all international damage arising from commercial human spaceflight. In the absence of specific provisions on the allocation of liability under international law, negotiations between States typically determine international liability for damages. As competition intensifies within the commercial human spaceflight industry and the number of commercial operators and their outer space activities continues to grow, there is increasing pressure on States to assume liability. Requiring an equal distribution without considering each launching State's degree of participation in commercial human spaceflight would clearly violate principles of fairness. However, if responsibility is allocated proportionally, determining appropriate criteria for establishing proportions becomes crucial.

The current legal framework governing outer space does not establish a sole basis for identifying the State with the greatest responsibility. As per Article 8 of the Outer Space Treaty and Article 1 of the Convention on Registration of Objects Launched into Outer Space (hereinafter referred to as the Registration Convention), jurisdiction over a space object and its occupants is vested in the launching State, contingent upon registration. Consequently, registration obligations are closely intertwined with the concept of a "launching State." A "State of registry" refers to a launching State that has duly recorded a space object in its registry, pursuant to Article 2 of the Registration Convention. By allocating jurisdiction and control over specific space objects and their occupants to one of the launching States through this registration system, international law pertaining to outer space establishes an explicit chain of responsibility between the launching State, said space object, its occupants, and international liability. Although outer space is considered a public domain beyond national appropriation by any single State, through this registration system, a State acting as registry can exercise jurisdiction and control over both its placed objects in outer space and their occupants.

3. Potential Solutions

The commercialization of human spaceflight necessitates a transparent, equitable, and supportive framework to ensure the benign and sustainable development of this emerging industry. To address the aforementioned challenge in system construction, it is imperative for the international community to establish an international liability regime for damages arising from commercial human spaceflight by leveraging existing provisions within the Outer Space Treaty System and drawing insights from domestic laws governing liability in commercial human spaceflight. In order to tackle legal

issues associated with constructing an international damage liability system for commercial human spaceflight, several measures can be adopted at the global level: confirming liable parties and claimants based on relevant relationships while allowing for multiple subjects; uniformly applying the principle of absolute liability across damage scenarios with fault being considered exceptional; maximizing protection of personal interests among various types of crew members involved in spaceflights; implementing limited mandatory insurance regulations to enhance risk management and cost control; establishing a responsible party system; introducing dual liability mechanisms that assign primary responsibility while allocating residual international liabilities based on their degree of connection with commercial human spaceflight.

3.1. Recognising Subjects by Relevance

The commercialization of human spaceflight necessitates the establishment of a transparent, equitable, and supportive framework to ensure the benign and sustainable development of this emerging industry. To address this challenge in system construction, it is imperative for the international community to establish an international liability regime for damages arising from commercial human spaceflight by leveraging existing provisions within the Outer Space Treaty System and drawing insights from domestic laws governing liability in commercial human spaceflight. In order to tackle legal issues associated with constructing an international damage liability system for commercial human spaceflight, several measures can be adopted at the global level: confirming liable parties and claimants based on relevant relationships while allowing for multiple subjects; uniformly applying the principle of absolute liability across damage scenarios with fault being considered exceptional; maximizing protection of personal interests among various types of crew members involved in spaceflights; implementing limited mandatory insurance regulations to enhance risk management and cost control; establishing a responsible party system; introducing dual liability mechanisms that assign primary responsibility while allocating residual international liabilities based on their degree of connection with commercial human spaceflight.[12]

Although the interpretation of State responsibility should consider the actual interests of the concerned State, in the context of commercial human spaceflight, it is essential to allocate responsibility based on relevant interests without contradicting the identification of a specific State as potentially liable. Hence, all States involved in commercial human spaceflight can be held accountable, including the State of registration, other launching States, and participating cooperating States. This implies that every State will have

12 Bin Cheng, Studies in International Space Law (Oxford University Press, 1st edn, 1997), p. 231.

an identifiable subject for liability claims in case of damage caused by commercial human spaceflight. Considering varying degrees of association with commercial human spaceflight among different States, an international regime could facilitate consensus-building on assuming liability and uniformly designate a particular State as internationally liable for damages.[13]

3.2. Uniform Application of Absolute Liability

With regard to high-risk activities on the surface of the Earth, the traditional principle of fault-based liability has been replaced by the principle of absolute liability. This means that international liability for damage from high-risk transboundary activities no longer considers subjective fault but only focuses on the resulting damage as a necessary element. However, beyond the surface of the Earth, the Liability Convention still applies fault-based liability principles. The drafting history of this treaty reveals that legislators primarily emphasized reaching a consensus on absolute liability for damage occurring on Earth's surface. There was only a simple agreement regarding negligence in Article 3 without an in-depth discussion about its meaning and difficulty in proving it.[14] Initially, normal operation of space objects relied on control measures taken by concerned states to prevent collisions between these objects within their jurisdiction. Nevertheless, there are distinctions between commercial human spaceflight activities and general activities involving non-human space objects. Commercial human spaceflight entails higher risk levels, greater complexity in operations, and wider implications concerning interests at stake, accident scale, and resulting damages.

The consistent application of the principle of absolute liability for international damage resulting from commercial human spaceflight implies that negligence is not a prerequisite for causing or suffering harm. International liability for damage is established whenever a space object involved in commercial human spaceflight and its crew's activities cause damage to another State's property or its natural persons, whether on Earth's surface or in outer space. The underlying mechanism proposed here lies in the failure of the responsible party to fulfill their duty of care, prevention, or cooperation, or in the misuse of their rights during the conduct of commercial human spaceflight activities, thereby violating the fundamental requirement set by international norms: "the use of one's property must not result in harm to others' property. Correspondingly, a State should also be held accountable for compensating damages to property, human life, and bodily harm arising from commercial human spaceflight activities. The

13 See Michel Bourely, "Rules of international law", (1987) in IISL Proceedings of the 29th Colloquium on the Law of Outer Space 159; and Michel Bourely, "Space commercialisation and the law", (1988) 4 Space Policy 135. 159; and Michel Bourely, "Space commercialisation and the law", (1988) 4 Space Policy 135.

14 See Stephan Hobe (eds.), Cologne Commentary on Space Law Volume II (Carl Heymanns Verlag, 2013), pp. 131-134.

consistent application of absolute liability not only demonstrates the cohesive nature of rights and responsibilities of the launching State but also incentivizes States to conduct outer space endeavors with greater caution. On one hand, launching States reap benefits from high-risk space activities and should assume corresponding liability in case of damage. On the other hand, given the close connection between commercial human spaceflight and personal safety, the uniform implementation of absolute liability prompts States to duly consider the interests of other nations during their space operations while exercising due diligence and vigilance to minimize collisions or harmful interference with commercial human spacecraft.[15]

3.3. Introduction of Compulsory Insurance Rules

The nascent commercial human spaceflight industry faces the potential risk of accidents, necessitating the formulation of relevant legal rules that acknowledge this certainty. To effectively manage and mitigate damage risks throughout the entire process of commercial human spaceflight, from planning to implementation, it is imperative to introduce uniform mandatory insurance regulations at an international level. These regulations should require all commercial operators to obtain insurance coverage for their crews prior to engaging in space activities. Despite varying levels of economic development among countries involved in this industry, the high-cost nature of commercial human spaceflight implies a certain level of economic strength. Similarly, due to its expensive nature, passengers participating in such flights need to be fully informed about associated risks and willingly assume them by signing an agreement. The international liability regime's insurance rules should mandate minimum coverage without specifying maximum limits so as to ensure comprehensive insurance protection for passengers engaged in commercial human spaceflight.[16]

The establishment of a viable insurance system within the international liability regime for damage is a crucial component for the robust development of the commercial human spaceflight market, which presents both opportunities and challenges to the insurance industry, given that standards and policies for risk management are yet to be developed. In order to alleviate the burden on commercial operators in procuring insurance and address concerns of insurance companies regarding high risks, preferential measures can be implemented at the governmental level while specific standards can be flexibly adjusted in accordance with the progress of commercial human spaceflight. On one hand, to incentivize the growth of

15 Van C. Ernest, Note, "Third Party Liability of the Private Space Industry: To Pay What No One Has Paid Before", (1991) 41 Case Western Reserve Law Review 503, pp. 536-537.

16 Denis Bensoussan, "Space tourism risks: A space insurance perspective", (2010) 66 Acta Astronautica 1633, p. 1634.

this industry, favorable tax policies can be formulated by governments to relieve pressure on commercial operators and insurance companies. Considering that commercial operators involved in hazardous operations will ultimately bear all or part of the liability arising from damage caused or suffered during commercial human spaceflight activities, it becomes imperative for these operators to share such risks through appropriate insurance coverage. The inherent uncertainty associated with the potential high risks of commercial human spaceflight necessitates that insurance costs and claims expenses will be significantly elevated during the extended start-up development phase, thereby imposing a substantial financial burden on commercial operators and demanding substantial insurance funding from insurers. To ensure adequate coverage purchase by operators and sufficient payouts by insurers, government subsidies in the form of tax credits or deductions could be provided.[17]

3.4. Developing a System of Dual Responsibility

In terms of the primary subject of liability, private entities conducting human spaceflight projects deviate from the traditional State-dominated operator of human spaceflight.[18] Considering the international implications of damages and the subordinate role played by commercial operators, it is appropriate to refer to liability allocation rules suitable for commercial human spaceflight activities by comparing existing international laws governing liability regimes for transnational damage. Regarding assumption of liability, there are generally three types of existing regimes: first, the State assumes responsibility for damages caused to a foreign State. For example, the Liability Convention stipulates that the launching State shall bear liability for any damage caused to other States by space objects launched either by the State or within its territory. Second, the dual liability regime establishes a shared responsibility between the State and the operator for any damage inflicted upon a foreign State. Third, operator indemnity entails direct liability on the part of the operator, whether it is a State or a private entity, providing limited compensation. This concept is similar to that found in the International Convention for the Prevention of Pollution from Ships. Fourth, the rationale behind these distinct modes of liability lies in varying degrees of benefit derived by the State from different activities and its level of involvement therein.[19]

17 D. Abecassis, The Law and Practice Relating to Oil Pollution from Ships, (Butterworth & Co Publishers Ltd, 1st edn, 1978), p. 204.

18 Vedda, James A, Study of The Liability Risk-sharing Regime in The United States For Commercial Space Transportation, (El Segundo, Calif.: The Aerospace Corporation, 2006), p. 32.

19 Yun Zhao, "A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space", (2009) 74 Journal of Air Law and Commerce 959, pp. 69-972. Commerce 959, pp. 969-972.

4. Conclusion

The emerging commercial human spaceflight industry has introduced commercial operators and non-professional space crews into space activities, significantly reducing the proportion of State behavior. This development has given rise to a series of complex issues regarding the identification, composition, assumption, and allocation of liability. Although domestic laws in some spacefaring countries have addressed the liability of commercial human spaceflight, it is essential to establish a basic consensus on an international level for damage liability due to the increasing trend of international cooperation in this field. Balancing the interests of private individuals, States, and humankind is crucial when constructing a legal system for international cooperation in the commercialization of human spaceflight. Developing a specialized international liability regime at an international law level serves as an important means for global governance over commercial human spaceflight activities by combining general law principles with specific regulations. Constructing such a regime requires all participants to seek common ground while respecting differences through cooperation and dialogue. A robust international liability regime can effectively ensure steady progress within the commercial human spaceflight industry, leading to immeasurable long-term economic returns and social benefits.