

# The Space Governance Gap and Sustainability: A Case for Alternative Dispute Resolution in the New Space Era

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## ABSTRACT

This study examines the “Space Governance Gap” that is said to be created by the move from state missions to the “New Space” era driven by commercial interests. It is being noticed that today it’s the private companies and massive satellite fleets that dominate the outer space, but the governing rules are stuck in the past. This situation has the potential to threaten the fragile environmental sustainability of the outer space. The authors here examine the existing treaties of the space law with a view to find out that if they can handle modern problems like orbital crowding and private commercial interests, and their impact on sustainability. The major focus of the study is to analyse the ‘dispute resolution’ mechanism under the treaty system and thereby highlight the so-called ‘governance gap’. The authors have analysed a few real-world cases like the *Cosmos 954* crash and the *Antrix-Devas* dispute, to point out the possibility of major flaws in the current governance framework. The study explores that the existing rules might have become too political, too slow, and sometimes ignore the interests of private commercial entities. Thus, it is being suggested that to keep space safe and sustainable, it is advisable to move away from rigid state-on-state lawsuits, and instead use the Alternative Dispute Resolution (ADR) for dispute resolution.

## 1. Introduction: The Near-Earth Environment as Global Infrastructure

Human development is increasingly connected to the near-Earth environment. For many years, space activities were driven by competition between states and concerns of national prestige. This phase has now changed. Today, the space sector has grown into an important industrial sector. There is no denying that satellites play a very important role in our day-to-day life. We depend on satellite services for activities such as weather monitoring, financial transactions and remote area Internet access. But now it is not limited to only necessary services, the space activities now include commercial interests for huge financial gains. Already we have large multinational companies showing lot of interest in developing space tourism, celestial mining, and even colonization of Mars.

This so-called commercialization of space activities is being led by private actors like SpaceX and Blue Origin. Because of this change in the character of activities in outer space and type of space actors, the present framework of space law may not be sufficient to provide required solutions. Recognizing the same, a few scholars have suggested that commercialization have exposed a “Space Governance Gap.” The primary reason of the same seems to be the context in which the fundamental space treaties were promulgated during 1960s and 1970s. When the 1967 Outer Space Treaty was drafted, it was designed for government programs. It didn't really account for a future filled with massive fleets of private satellites. Because of this, our current rules may struggle to keep up with the fast-paced challenges of the modern era. As Brittingham (2010) notes, international law still lacks the specific language needed to effectively regulate private firms in a commercial environment. This study explores why traditional methods of settling space disputes might no longer be sufficient. The authors have attempted make a case for a specialized Alternative Dispute Resolution (ADR) forum for dispute resolution.

It is noticeable that commercial space era is characterized by the placement of huge number of satellites in space, which may not have been anticipated by the makers of early space law treaties. According to Lyall

and Larsen (2018), the initial set of rules was created only to preserve peace among nations and not to regulate operations of many privately owned satellites. The existence of multiple operators in one location might lead to conflicts of various nature, such as physical close-approaches and radio-frequency interferences. It was opined by Vlasic (1991) as back as 1991, that there is a lack of dispute resolution mechanism under space law.

One important issue is that international law declares space to be a "global commons," but does not offer necessary means to protect the asset accordingly. It is a general understanding that in any common place, the carelessness of one operator will affect the interests of everyone else. An impact may produce a cloud of debris that stays in space for decades. Such a scenario may constitute a case of a "Tragedy of the Commons," where short-term economic motivations result in environmental degradation. According to Jakhu (2010), it is hard to assign responsibility for such a situation until something happens because of the lack of binding guidelines for private parties involved. Also, the Liability Convention of 1972 is more reactive than preventive. It means that compensation will be paid only after damages have occurred, but not in advance (Foster, 1972).

It is pertinent to note that as per Article VI of the Outer Space Treaty, private actors of a country ought to work under the supervision of state where they operate. However, the current state of international affairs does not allow for a national-based regulation system to be effective in the context of globalization. In the case of a conflict between two foreign private entities, the present space law has no established mechanism to resolve it. Prevalent diplomatic procedure through state channels, is more likely to drag the matter into politics, and long delays. This paper suggests that by utilizing ADR, technical experts can resolve these conflicts more efficiently than state representatives. As Tronchetti (2013) notes, the complexity of modern space operations requires a move away from rigid litigation toward flexible, expert-led solutions. In order to ensure that the near-Earth environment remains a viable resource for future generations, it would be sensible if ADR becomes a norm for resolving space disputes.

### **1.1. Key Research Questions and Objectives**

The primary research question asks whether traditional, state-centric space treaties can effectively manage a modern environment filled with private companies and mega-constellations. Specific sub-questions include how to establish "fault" in orbital collisions and how to resolve disputes between private entities without political interference.

The main objective is to explore why current methods for settling space disputes are no longer sufficient. The study aims to make a case for a specialized Alternative Dispute Resolution (ADR) forum. This would allow technical experts to solve problems more efficiently than state diplomats. It also seeks to find ways to protect the near-Earth environment as a sustainable "global commons" for future generations.

## **2. Methodology**

This study uses a qualitative approach based on legal analysis and case studies. It examines the five foundational international space treaties, with a heavy focus on the 1967 Outer Space Treaty and the 1972 Liability Convention.

The authors use a case-study method to test the existing framework. They look at historical events like the *Cosmos 954* crash and the 2009 *Iridium-Kosmos* collision to identify practical failures in the law. Finally, the study analyzes emerging legal models, such as the PCA Optional Rules and Online Dispute Resolution, to propose a way forward.

## **3. Literature Review**

Existing literature highlights a "Space Governance Gap" because early treaties were designed for government programs, not private firms. Lyall and Larsen (2018) note that original rules were made to preserve peace between nations rather than regulate thousands of private satellites. Vlasic (1991) argued decades ago that space law lacks a functional dispute resolution mechanism.

Scholars also point out the limits of the 1972 Liability Convention. Foster (1972) explains that the convention is reactive; it only provides compensation after damage has already happened. Hurwitz (1992) observes that the burden of proving "fault" in space is a major hurdle because the necessary data is usually held by the party that caused the accident. Regarding environmental concerns, Jakhu (2010) applies the "Tragedy of the

Commons" theory to space, noting that short-term economic goals lead to long-term degradation. To fix this, Tronchetti (2013) suggests moving away from rigid litigation toward flexible, expert-led solutions.

#### **4. The Existing Framework: A State-Centric Heritage**

The current legal framework governing space activities is based on the said five space law treaties. But when it comes to dispute resolution, the primary mechanism is provided under the Outer Space Treaty (OST) of 1967 and the Liability Convention of 1972. These treaties were developed during the time when the space activities were carried out by the states. As a result, the framework reflects a state-centered approach, that may not be able to fully address the complexities in relation to commercial space operations.

##### **4.1 The Liability Convention: A Binary System**

The 1972 Liability Convention remains the only international agreement that outlines a specific procedure for resolving disputes. It functions through a two-tiered approach depending upon the location of the damages (United Nations, 1972):

- **Absolute Liability:** As per Article II, a State shall be absolutely liable for any damage sustained on the surface of the Earth or to aircraft in flight by damage caused by a space object launched by it. It is a stringent approach in which there is no need to prove any fault.
- **Liability Depending Upon Fault:** As per Article III, in case the damages arise due to collisions between satellites in outer space, then the liability of a launching state depends upon the fault of that launching state or its personnel who are responsible for causing the accident.

Though this two-tier approach ensures that there is clarity of legal principles, but it is severely limited by the fact that the system is too rigid in its "State-to-State" approach. According to article 9 a private company or individual cannot directly bring a claim against another state. Instead, only a state is entitled to present claim of compensation against another state. This approach appears to assume that interest of private parties aligns with those of their respective states. Also, if diplomatic negotiations do not lead to a resolution, the process proceeds to its final stage, namely the establishment of a Claims Commission.

##### **4.1.1 Claims Commission: Structure and Procedural Barriers**

The said final stage, as provided under Articles XIV to Article XX of the Liability Convention triggers when diplomatic efforts fail. It establishes a Claims Commission that consists of one member each from the claimant state and the launching state, and a chairman chosen jointly. It has a practical difficulty of agreeing on the common name of the chairman within four months' time. And if the parties fail, the Secretary-General of the United Nations may be requested to make the appointment. It is likely that even the formation of the claims commission would be a very slow process. Thus, in the rapidly evolving commercial space sector, delays of this nature may be a significant factor, and may act as a deterrent to seeking relief through this mechanism.

##### **4.1.2 The Issue of Non-Binding Decisions**

Perhaps the most critical limitation of the Claims Commission is the non-binding nature of its final decision. As per Article XIX, the Commission's "decision" is only final and binding if the parties have specifically agreed to make it so. If there is no such mutual agreement, the Commission's decision shall be only a "recommendatory award". The 'recommendations' may or may not be accepted by the parties, making the whole exercise meaningless.

It may be noted that the reasoning behind non-mandatory nature of Claims Commission might be the political realities of the 1970s when the Liability Convention was implemented. The States were unwilling to surrender their sovereignty to a mandatory international tribunal. The situation can be more critical for a private commercial actor that may have suffered millions of dollars in damages. Therefore, the claims commission under the Liability Commission is not one of the preferred forums of dispute resolution under the space law.

##### **4.1.3 Evidentiary Challenges and Technical Fact-Finding**

The task given to the Commission includes determining both the extent of the damage and the amount of compensation to be awarded. This may require a complex analysis of "fault" under Article III, for example: in the case of a collision in the orbits. It will be extremely difficult to prove 'fault' in space as it may require access to sensitive satellite telemetry data, orbital tracking information, and proprietary software code.

There is no mandatory supportive process provided for the claims commission for discovery or investigation. A state may refuse to provide data on ground of national security or commercial secrecy.

Thus, the Claims Commission lacks the powers in the nature of a domestic court, so as to verify the facts and ensure liability in terms of fault. Also, as **Hurwitz (1992)** pointed out, the burden of proof in fault-based liability is a major hurdle for any claimant, as the information required to prove negligence may always be in the hands of the party that caused the damage.

#### **4.1.4 The Political Cost and the “Shadow” of the Law**

From the process of establishing a Claims Commission it can be seen that it's a political decision. Thus, a state may decide not to pursue a valid claim for a private company if doing so would endanger a broader strategic alliance or a sensitive trade deal. It is also noteworthy that as per Article XX the expenses of the Commission shall be borne by the parties. It may act as a negative incentive for a smaller nation to bear the cost of funding a multi-year international legal battle against a space-faring superpower.

It is pertinent to note that the Claims Commission has never been used in the entire history of space exploration. This reveals the lack of trust of the stakeholders on the system. In the Cosmos 954 case, Canada and the USSR found a diplomatic resolution without recourse to a claims commission (Schwartz, 1982). The lack of usage implies that the process is perceived as being complicated or difficult to follow. States would prefer to resolve their differences “under the shadow of law”, whereby the threat of the Convention forces a diplomatic compromise. Though this method may serve well for cases involving state-to-state accidents due to debris, it may not be sufficient to address the anticipated varied types of disputes that may arise in the next decade.

#### **4. Contemporary and Existing Challenges:**

The so-called “New Space” age may have overtaken existing legal regimes meant to manage it. As mentioned, the treaties were focused on the peaceful utilization of outer space and the prevention of any nuclear arms placement in orbit. It's likely that they have failed to consider a dense and commercialized atmosphere above Earth. In modern times, there are many problems confronting the international community concerning contemporary and future concerns, which put the current space regime to the ultimate test (Larsen, 2018).

##### **5.1 Orbital Congestion and Mega-Constellations**

The most immediate challenge is the rapid increase in satellite deployments, particularly in Low Earth Orbit (LEO). Large-scale systems- the mega-constellations, require deploying thousands of satellites for worldwide telecommunications. This would inevitably increase the number of objects in orbit.

For instance, in 2019, the European Space Agency (ESA) conducted an operation that prevented the Aeolus satellite of ESA from colliding with the SpaceX Starlink satellite. Although the operation succeeded, it brought attention to the critical problem – the lack of a mandatory international STM system. Presently, conjunction analysis and collision avoidance operations are managed by mutual consent among operators or informal communications. There is no central authority and legal mechanism to solve any disputes on who should maneuver their object during a possible collision (Larsen, 2018).

##### **5.2 The Environmental Crisis: Space Debris and Remediation**

Space debris is a polycentric problem – a situation that affects multiple interests that intersect with each other and all parties that use outer space. But it is not clear that who shall be responsible for the regulation of this issue. According to the definition provided by the Liability Convention, the term “space object” encompasses not only the complete item but also its component parts, meaning that any debris of a satellite belongs to its state of origin regardless of the nature of the fragment.

It constitutes a substantial legal obstacle to ADRs development. In case one country or a private corporation starts removing debris without receiving permission from the owner country, it could face claims concerning the violation of sovereignty over outer space. As Hobe states in his paper, even if it is possible to assume that there exists a duty to remedy environmental problems based on general principles of law, it would be impossible to solve these issues because there is no specialized dispute resolution mechanism regarding space debris. It leads to such an issue as legacy debris costs.

##### **5.3 Resource Extraction and the Non-Appropriation Principle**

The Non-Appropriation Principle enshrined in Article II of the Outer Space Treaty stating that outer space is not subject to national appropriation by claim of sovereignty, is one of the most fundamental basis of space governance. But, the plans of private actors to extract resources through celestial mining is challenging this long-standing principle. The Legislation such as the 2015 US Commercial Space Launch Competitiveness Act and the multi-national Artemis Accords suggest that while nations cannot “own” the Moon or other celestial

bodies, the private entities may own and sell the resources they have extracted from it. This clearly raises the governance questions and also may become a cause of conflicts in future that may not be sufficiently addressed by existing framework. For example, specific areas on the lunar poles offer near-constant solar energy and are highly valuable for future bases there. So, if multiple commercial entities are trying to operate in the same location, no mechanism is there to resolve competing claims. Thus, it may be noted that without a clear system for licensing and priority, resource extraction could lead to localized conflicts that the 1967 treaty may not be fully equipped to address.

#### **5.4 Spectrum Interference and Orbital Slot Scarcity**

Other than physical collisions between satellites, frictions or conflicts may also arise over the use of the electromagnetic spectrum and orbital slots distribution. *These* resources are managed by the International Telecommunication Union (ITU). But in this case also, the systems and procedures were designed for an era of lesser number of actors. Due to the rise of mega-constellations, some of the common concerns that have arisen are "spectrum squatting" and signal interference. When two satellite networks operate on similar frequencies, the resulting interference can degrade services for users on Earth. These are technical disputes, and to resolve them, the ITU system prescribes a long and mostly ineffective 'coordination process'. This process lacks the enforcement power to settle high-stakes commercial disagreements in a time effective manner.

#### **5.5 Cybersecurity and Dual-Use Assets**

Cybersecurity of digital infrastructure, being relied on for space activities, is one of the recent challenges faced by space law framework. Digital medium makes the satellites vulnerable to jamming, spoofing, and cyber-attacks. It is to be noted that many space assets are "dual-use", meaning they serve both commercial and military-strategic purposes. A dispute arising from a cyber-interference event could quickly escalate into a security crisis. The existing legal framework does not clearly define 'interference' in the digital sense, nor does it offer a non-political forum to adjudicate claims of cyber-sabotage between private or state-linked space actors.

### **6. Case Studies:**

The effectiveness of the existing legal framework can be analyzed only by examining how past and present disputes have been resolved or managed. These case studies reveal a recurring pattern: the existing space treaties are often bypassed or used merely as a backdrop for diplomatic compromise, rather than as a source of binding legal resolution. It is a common phenomenon that whenever a significant incident occurs, political considerations or financial recovery is prioritized by the parties involved, rather than thinking about the development of a consistent body of space law.

#### **6.1 Cosmos 954: The Limits of the Liability Convention**

The 1972 Liability Convention was most significantly tested during the events that followed the 1978 crash of the Soviet satellite Cosmos 954. It happened that the malfunctioning of the satellite resulted in the spreading of the radioactive elements in large parts of north-western Canada. It was the first and the only incident resulting in the application of the liability provisions of the Convention to date. Canada claimed the applicability of absolute liability principle as the damages were incurred on land by the satellite- Soviet Union being the launching state.

However, it should be noted that in settling the dispute, a Claims Commission or any judicial procedure was not involved. Rather, a diplomatic "Protocol" was signed by the two countries in 1981. Initially, Canada had demanded a compensation of over 6 million CAD, while the Soviet Union agreed to pay just 3 million CAD as the final settlement. As observed by Alexander (1982), this was more of a diplomatic concession on behalf of the Soviet Union than an actual application of the laws of liability. In refusing to recognize its "liability," but rather offering a "payment," the Soviet Union negated the utility of the convention as a precedent.

Three key weaknesses were brought forth by this case:

- Reactiveness: The Treaty is only applicable when an accident happens. It lacks an arrangement that would allow for the tracking of the damaged satellite prior to the accident in order to prevent the problem.
- Obscurity: In light of the fact that the resolution of the conflict took place behind closed doors, it failed to provide a clear definition of "damage." According to Schwartz (1982), such obscurity makes it impossible for the international community to develop a clear standard.

- Political Considerations: The amount that the country had to pay was more driven by political considerations rather than an objective calculation of the expenses involved in cleaning up the environment.

## **6.2 The Antrix-Devas Saga: The Shift to Investment Law**

While Cosmos 954 was a state-to-state matter, the **Antrix-Devas** dispute represents the new reality of commercial space friction. The issue in the present instance arose due to cancellation of the agreement between Antrix, the commercial entity operating under the Indian Space Research Organisation, and Devas Multimedia, a private firm in relation to the leasing of S-band satellite spectrum. While the Indian Government was concerned about the safety of national security, the private investors saw this as expropriation of their interests.

In the scenario, Devas and its investors relied on International Investment Law rather than general international space law. They launched various cases through arbitration under bilateral investment treaties (BITs) and International Chamber of Commerce (ICC), thus leading to multibillion dollars worth awards against India. As Stephan explains, using investment tribunals enables private players to file suit against States without the necessity of getting their governments involved.

The significance of this case is evident in the fact that this case shows how private players are increasingly trying to overcome the "Space Governance Gap" by investing and resorting to commercial arbitration. According to Newman (2015), however, investment arbitration is created to secure investments and compensate for any monetary loss. It cannot deal with the larger issue of the "global commons," such as ensuring sustainability and preventing space junk. The Antrix-Devas dispute clearly indicates that commercial law alone can resolve the monetary aspects of a space dispute but not the environmental and technical aspects.

## **6.3 The Iridium-Kosmos Collision (2009): The Silence of Law**

In 2009, a functioning American Iridium satellite collided with a defunct Russian Kosmos-2251 satellite. It was perhaps the first time in history where a high-speed collision occurred between two functioning spaceships. In spite of the immense number of debris the collision created, thus increasing the likelihood of future collisions for everybody using the orbit, no case was ever brought forward as a matter of legal liability under the Liability Convention.

The reason behind the lack of any legal action was the high level of difficulty of establishing "fault" as stated by Article III of the Convention. It was noted that both the USA and Russia were reluctant to share sensitive telemetry data, something that was necessary to establish negligence on the part of one of the parties. According to Weeden (2010), the excessively high threshold set by the concept of fault-based liability is an effective deterrent against initiating legal proceedings. This situation illustrates quite clearly how, when the bar for legal action is set too high and the process itself becomes too political, even such a disaster yields no accountability.

## **6.4 Envisat and the Risk of Inaction**

Another illustrative example of the limitations of current governance is the case of **Envisat**, a large, defunct European Space Agency satellite that remains in a highly populated orbit. As the space law (Article VIII of OST) is clear on the point that space objects remain in the perpetual possession of the launching state, no one else would have any right to move or dispose of Envisat without the permission of its owner.

In case, such a collision would occur, it might lead to a cascade of collisions (Kessler syndrome). And that would make some orbits unusable for future missions. As Listner (2012) suggests, "sovereignty" is better protected under the existing legislation than "sustainability," meaning that there are no legal means by which to force an actor to remove a dangerous object before it creates problems. This example shows the lack of coherence between ownership and environmental issues that has always been evident in traditional space legislation.

Thus, it may be said the nature of modern space activities may require new mechanisms of regulation. It can be concluded that the Outer Space Treaty and the Liability Convention were designed to regulate occasional high-level diplomatic conflicts between superpowers but not the regular problems with a commercial context.

## **7. The Standing Barrier and the Article VI Bottleneck**

The private actors still lack legal standing under the space law. Article VI of the OST provides that it's the states that shall bear international responsibility for all "national activities in space", even though it is

conducted by “non-governmental entities”. It is true that this has prevented states from evading their international liability (responsibilities) by delegating their obligations to private players, but it has presented a procedural roadblock that has excluded corporations from the international legal regime.

As it has been seen, that the right to bring forth a claim belongs to states only, as per the Liability Convention. Thus, in the case of a collision between the satellite constellations of two private companies, it is not clear that they could go to any international tribunal for redressal or resolution. As per Article IX, they have to approach the matter through their respective “Launching States”, who then could decide to pursue their claims; but that would most likely be in a political context, and not legally. On this, Goh (2007), has observed that this means turning what should be a business matter into politics. So, if the government in question determines that making a claim might damage its relations with the other state in the greater diplomatic or economic sense, the corporation may not have any other options to do anything legally.

### **7.1 Procedural Delays and Commercial Interests**

Every satellite has a self-life cycle; especially a small satellite would have three to five years of operational life span. Now, if we see the pace with which the mechanism of claims commission moves, it may not align with the financial interests involved. The existing legal framework under the Liability Convention may require a year of diplomatic efforts before the parties can consider forming a claims commission. Thus, it's very difficult for the private actors to rely on this mechanism as their main objective would be to make financial gains, and to ensure investor confidence and insurance stability.

Additionally, as discussed above, under Article XIX, the Commission's final award is only “recommendatory” unless both states have specifically agreed to uphold it in advance. This lack of certainty makes the claims commission unattractive for commercial entities.

### **7.2 Jurisdictional Ambiguity in a Globalized Economy**

The practice under the present space law regime is that each space object belongs to one nation or state. This does not align with the contemporary space industry as there is no guarantee that an object will be made, launched and operated from within the jurisdiction of any single state. Thus, there can be ambiguity regarding jurisdiction as to which country should be deemed to be the “Launching State” and may be responsible for liability.

### **7.3 The Absence of Preventative Mechanisms**

It can be noted that the existing framework of space law is more reactive than prohibitive. The main focus of both the OST and the Liability Convention is on what happens after an accident has occurred. The treaties do not provide a provision that allows for a mandatory dispute resolution process to prevent a collision or to compel the removal of a hazardous object.

It is there in Article IX of the OST that “international consultations” would be done if an actor believes an activity will cause harmful interference. But these are also voluntary and lack an enforcement mechanism. This has left the near-Earth environment vulnerable to the “Tragedy of the Commons”, where the law only intervenes once the resource has already been damaged. Thus, there is the need for a system that prioritizes environmental concerns over late-stage litigation.

## **8. Emerging Models of Dispute Resolution:**

In the light of apparent systemic limitations of the treaty framework, it became a necessity for the stakeholders of space activities to explore new models for managing space-related conflicts. These emerging solutions are aimed at bridging the so-called “Space Governance Gap”. The solutions provided there seem to offer more flexible, inclusive, and technically proficient platforms than those provided by the earlier framework.

### **8.1 The PCA Optional Rules (2011)**

The Permanent Court of Arbitration (PCA) Optional Rules for Arbitration of Disputes Relating to Outer Space Activities were introduced in the year 2011. This was a significant step that took into consideration the specific features of business aspect of space sector. It may be observed that under the PCA rules, there is room for numerous subjects of legal relations, among which are States, international organizations, and business entities.

The PCA rules have introduced the institution of a special arbitral tribunal, including a panel of arbitrators and scientific experts to ensure their technical proficiency concerning orbital parameters. But, the biggest flaw of such a system may be its strict voluntariness. Arbitration is a procedure that can be performed only with the participation and agreement of all the parties involved. According to Hertzfeld & Nelson (2013), the

major problem here is that the commercial entity or State dominating in the market might not have any reason to agree on such an issue with another participant of the market.

## **8.2 The Multi-Door Courthouse Approach**

Academics such as Goh (2007) have recommended the use of the "Multi-Door Courthouse" approach for space disputes. According to this idea, there is no particular way to resolve all space disputes in a single way. Rather, a central body would provide a variety of approaches to resolving space disputes as follows:

- Mediation: To resolve technical and quick coordination disputes between the operators of satellites.
- Arbitration: To resolve any commercial disputes.
- Adjudication by Judicial Body: To settle sovereignty and treaty-related disputes.

This idea recognizes the fact that a dispute concerning frequency interference is quite different from a dispute related to lunar territory in terms of expertise and time frame required.

## **8.3 Online Dispute Resolution (ODR) and Real-Time Telemetry**

Keeping in mind the digital nature of space sector, a more contemporary suggestion came in the form of the use of Online Dispute Resolution (ODR). Since most modern space disputes are data-driven, resolution could theoretically be automated or facilitated through digital platforms.

There are self-executing smart contracts with the use of blockchain technology. These types of contracts may be in the form of orbital agreements such as right-of-the-way protocols. Thus, if a satellite fails to move during a predicted conjunction, a pre-agreed ODR framework could automatically assign fault or trigger insurance payouts based on shared telemetry logs. It was suggested by Reinstein (2021) that moving dispute resolution into the digital sphere may match the speed of the "New Space" industry. And it has the potential to remove many of the bureaucratic delays inherent in physical courts.

## **8.4 The "Soft Law" and Industry Standards Approach**

It is also to be noted that in the absence of new binding treaties, many space actors are turning to "soft law" mechanisms. This includes the IADC Space Debris Mitigation Guidelines and the UNCOPUOS Guidelines for the Long-term Sustainability of Outer Space Activities. It's true that these are not legally binding, but they are being incorporated into national licensing requirements for their efficacy. Thus, some scholars are proposing the use of these standards as a basis for a "Stewardship-based" dispute resolution model.

This would have a specialized body to judge disputes based on whether the parties adhered to these widely accepted industry best practices. This shifts the focus from "sovereign rights" to "environmental responsibility". As Tronchetti (2013), these soft law norms may solidify, and may gradually crystalize into customary international law. This would provide a standard of care that can be used in future ADR proceedings.

## **8.5 Regional and Sectoral Agreements**

In the absence of globally binding mechanism, a few regional or specialized governance models have come up, such as the Artemis Accords. Though it's a political agreement designed for lunar exploration, but the Accords include provisions for "Safety Zones" and the coordination of activities to avoid harmful interference. These lateral agreements may serve as a testing ground for dispute resolution rules among a smaller group of like-minded actors. It can be argued that this may lead to the fragmentation of international law, but the proponents suggest that these small-scale successes could eventually be scaled up to a global level that would provide a practical pathway out of the current governance deadlock.

## **9. Way Forward: Environmental Stewardship through ADR**

In this final section of this study, it is suggested that the way to a sustainable orbital economy lies in moving away from reactive, state-centric litigation and leaning towards a new model of Environmental Stewardship through ADR.

### **9.1 The International Space Tribunal (IST): A Shift to Technical Adjudication**

It would not be out of place to suggest that it has become necessary to have a specialized, permanent body for space related dispute resolution, viz., an International Space Tribunal (IST), which would be handle the complexities of modern space operations. This institution would be different from the generalist nature of the International Court of Justice, and would be specifically designed to handle the high-velocity, high-data environment of "New Space".

It is suggested that the central feature of this proposed tribunal would be a "Technical Jury" consisting of orbital mechanics, aerospace engineers, and data scientists. This body would not merely interpret legal texts but would make binding findings on whether an operator adhered to "Best Practices" of the sector. Thus, by



empowering a body to judge the technical merits of a maneuver or a satellite's end-of-life plan, space law would move from a "pay-for-damage" model to a "prevention-of-damage" model.

As **Listner (2012)**, also supported this shift while noting that the current reliance on Article III of the Liability Convention requires proving "fault", which is nearly an impossible task without a body capable of analyzing complex telemetry. Thus, a specialized tribunal could adopt a "strict liability" approach for environmental negligence, incentivizing companies to prioritize safety as a matter of legal compliance rather than just commercial risk management. Also, as suggested by **Williams (2005)**, such a body would be able to provide a "compulsory adjudication" mechanism, which was not done by the 1972 Liability Convention.

### 9.2 Online Dispute Resolution (ODR) and Real-Time Mediation

As noted above, the modern space disputes are inherently data-driven, they are also suited for Online Dispute Resolution (ODR). In many cases, the facts of a dispute are contained entirely within telemetry logs and frequency data. This information can be fed into digital platforms to facilitate real-time mediation.

The ODR may provide several advantages for the "New Space" era. First, it eliminates the geographic and financial barriers associated with traditional international courts. Second, it matches the operational speed of the industry. As **Reinstein (2021)** pointed out that a digital ADR framework could provide "real-time" mediation, allowing technical experts to resolve conflicts as they occur. It is argued by **Sandau (2012)** that the integration of digital mediation into Space Traffic Management (STM) would allow for the "dynamic allocation" of orbital slots, and would resolve interference disputes in hours rather than the years. It is to be noted that this approach reduces the reliance on national bureaucracies and allows the industry to self-regulate through expert-led, confidential forums that protect proprietary commercial data.

### 9.3 Integrating ADR into National Licensing

The said specialized ADR regime would be effective, if it is supported by national regulatory frameworks. It is suggested that the States could make participation in a recognized ADR forum a mandatory condition for granting a space license under Article VI of the OST. By doing so, states would be able to fulfill their duty of "continuing supervision". And the commercial entities would have a faster, more reliable way to resolve international conflicts"

This would create a global network of "Safe Harbors" where operators who agree to ADR standards are given priority access to orbits or spectrum. It was pointed out by **Masson-Zwaan (2017)** that since the OST does not specify how a state should supervise its private actors, mandating ADR is a legitimate exercise of domestic jurisdiction. This will strengthen international order. Also, by using market incentives, such as lower insurance premiums for companies participating in ODR, legal reforms can be driven more effectively than waiting for a new global treaty.

## 10. Conclusion: Preserving the Global Commons

It is not in doubt that the Near-Earth Environment is no longer a distant frontier; it is a finite, fragile resource that serves as the backbone of modern civilization. Our development on Earth is now tied to the stability of our orbits. But the lacuna is that we are trying to manage this 21st-century industrial commons with 20th-century diplomatic tools.

The present study has tried to argue that the existing "Space Governance Gap" is not just a lack of law, but a lack of adaptive law. It was found that the 1972 Liability Convention and the state-centric focus of early treaties are no longer sufficient to govern a world of private mega-constellations and commercial space ambitions. It would be noted that the current system is too slow, too political, and too technically limited to prevent the so-called "**Tragedy of the Commons**" in space. Thus, as **Hardin (1968)** originally argued it in a general context, and later **Jakhu (2010)** applied it to space context; the absence of an enclosure or a management system would lead to the inevitable ruin of the shared resource, that is outer space.

It is suggested that the shift toward Alternative Dispute Resolution (ADR) is more than a matter of commercial convenience. It is a normative prerequisite for intergenerational equity. It was highlighted by **Sands (2003)** that international environmental law must protect the rights of future generations. In the context of space, this means ensuring that orbits do not become so congested with debris that they become inaccessible. Thus, if the world community fails to establish agile, expert-led mechanisms for resolving orbital frictions, there is a risk that the Kessler Syndrome, a cascade of collisions that could render the near-Earth environment unusable for centuries.

Thus, to fulfill our role as stewards, we must bridge the governance gap with institutions that are as agile and technically advanced as the satellites they would govern.

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