

## LEGAL ISSUES RELATING TO UNAUTHORISED SPACE DEBRIS REMEDIATION

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*Following loss of contact with the earth observation satellite Envisat on April 2012, the European Space Agency declared the end of its mission a month later in May 2012 after failed attempts to restore control. This minibus-sized satellite weighing 8 metric tons is currently drifting uncontrolled in the low Earth orbit. The increasing proliferation in the population of uncontrollable man-made objects in the earth orbit poses severe navigational threats to functional satellites and other space assets. Studies conducted on achieving long-term security and sustainability of outer space activities reflect the consensus of the scientific community that space debris remediation in the form of active removal of debris is essential to prevent cascading collisions between the space debris in orbit.*

*This paper will explore the body of space law and its implications on space debris remediation. Relying on the example of Envisat, it will be demonstrated that the existing framework of international space law does not authorise interception with space objects without the prior consent of the State of Registry. In the case of a removal of an object without the authorisation of the State of Registry, it would constitute an internationally wrongful act. This paper will further draw attention to the need to effectuate unambiguous interpretation of the existing provisions of international space law and the need for close cooperation between members of the international space community for the smooth operation of space debris remediation. Finally, it will conclude that the current provisions of international space law are adequate to address any potential legal controversies arising in this context and there is no need for any amendment or reform in the current legal framework by concluding a new treaty.*

### 1. INTRODUCTION

The international space community has been cognisant of the growing threat of orbital congestion since the 1980s. However, concerted international action to address the problem did not begin until the establishment of the Inter-Agency Space Debris Coordination Committee (IADC) by the various national and regional space agencies in 1993 to foster dialogue across nations.<sup>1</sup> The IADC adopted a set of guidelines for space debris mitigation measures in 2002.<sup>2</sup> With a view to expediting the international adoption of voluntary debris mitigation measures, a Working Group of the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) collaborated with the IADC to update and revise the IADC guidelines on debris mitigation. Finally, the agreed upon guidelines were adopted<sup>3</sup> and subsequently endorsed by COPUOS in 2007,<sup>4</sup> as the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.<sup>5</sup>

Since the launch of Sputnik I in 1957,<sup>6</sup> space debris in the form of uncontrollable man-made objects in the earth orbit continue to pose increasing navigational threats to functional satellites and other space assets, including human space flight and robotic missions.<sup>7</sup> The International Space Station has had to perform more than a dozen collision avoidance manoeuvres in the last decade.<sup>8</sup>

It is clear that the preventive measures taken during the last decade in the form of voluntary non-binding debris mitigation guidelines have clearly not been able

to effectively address the impending catastrophic situation. Based on scientific analysis and the projections made by various technical models, the only way to ensure secure and sustained access to and long-term utilization of space is through space debris remediation in the form of active removal of debris and on-orbit satellite servicing.<sup>9</sup>

Unlike space debris mitigation which aims to arrest the generation of further debris, space debris remediation refers to actively remedying the congested nature of outer space. Remediation activities can include retrieval of a space object from the outer space environment or from a particular orbit, repairing/servicing a space object, refuelling missions to extend the life of the space object or salvaging a space object for recycling or other purposes. On-orbit servicing and salvaging operations remediate space debris by repairing and restoring manoeuvrability in an object or removing it to avoid collision with a functional satellite. The following sections will study the implications of the existing framework of international space law and public international law on space debris remediation.

### 2. DEFINITION OF SPACE DEBRIS FOR ACTIVE REMEDIATION

The objective of this section is to study the question: is 'space debris' equivalent to a 'space object' *ad infinitum*?<sup>10</sup> It is important to draw a distinction between a 'space object' and a piece of 'space debris' because the absence of a clear legal definition introduces severe ambiguity in the enforcement of the rights and obligations assigned to States in relation to

the objects they have launched in space or the debris created by their activities in outer space. To understand the legal milieu in which space debris are sought to be regulated, it is necessary to study the definition of 'space debris.' First, this section will chronologically discuss the international legislative attempts to define a 'space object.' It will then address the current definition of 'space debris' with its origin in 'soft law' and its implications in the operation of space activities. Finally, it will comment on the legal uncertainties surrounding the status of objects in space vacillating between that of a 'space object' and/or 'space debris' by relying on the example of the decommissioning of the Envisat satellite by ESA.

The current regime of international space law, consisting of the five United Nations treaties and five Declarations, does not contain any definition of 'space debris.' The operative terminology used in those instruments is a 'space object,'<sup>11</sup> which has been rather obliquely defined.

Article VII of the Outer Space Treaty<sup>12</sup> lays down that the launching State will be held internationally liable for damage caused by an object launched into outer space or its component parts. This principle is echoed in Article II of the Liability Convention<sup>13</sup> which states that: "A launching State shall be absolutely liable to pay compensation for *damage caused by its space object* on the surface of the Earth or to aircraft in flight." (emphasis added) Further, Article III of this Convention emphasizes this criterion again to determine liability for damage caused elsewhere than on the surface of the Earth. Hence, the concern over the absence of a proper definition of 'space object' is aggravated by the fact that "the basis of liability is that the damages or injury is caused by a space object."<sup>14</sup>

### 2.1 Defining a 'Space Object'

Even prior to the promulgation of any of the space law treaties, the Convention for the Establishment of a European Organization for the Development and Construction of Space Vehicle Launchers (ELDO) defined a 'space vehicle' as "a vehicle designed to be placed in orbit as a satellite of the Earth or of another heavenly body, or to be caused to traverse some other path in space..."<sup>15</sup>

In the 1963 Declaration of Legal Principles<sup>16</sup> which serves as the precursor to the 1967 Outer Space Treaty, a space object has not been defined but has been referred to as "object launched into outer space and ... their component parts." Adopting this language, the 1967 Outer Space Treaty has alluded to a 'space object' in Articles VII and VIII as "an object launched into outer space," including "objects landed or constructed on a celestial body."

The Liability Convention was the first international agreement, which attempted to define a 'space object' as "component parts of a space object as well as its launch vehicle and parts thereof."<sup>17</sup> The Registration Convention adopted this definition in its Article I(b).<sup>18</sup> This description fails to define the term exhaustively while merely providing a vague inclusive boundary for the term. Strikingly enough, it does not include functionality as a decisive criterion.<sup>19</sup>

The term 'space object' has not yet been defined in international space law. More importantly, it is also silent as to when, if at all, a space object or its component or fragmented parts, ceases to be a 'space object.' Assuming that there is no change in the status of such fragmented space objects and are still continued to be regarded as 'space objects' under international space law, then *de jure* jurisdiction and control will be retained by the launching State on whose registry the space object is carried.<sup>20</sup>

The definition for a 'space object' prescribed by Baker in his excellent treatise on the legal status of space debris is of particular importance. He postulates that a 'space object' –

1. Means
  - (a) any object
    - (i) intended for launch, whether or not into orbit or beyond;
    - (ii) launched, whether or not into orbit or beyond; or
    - (iii) any instrumentality used as a means of delivery of any object as defined in 1(a); and
2. Includes
  - (a) any part thereof or
  - (b) any object on board which becomes detached, ejected, emitted, launched or thrown, either intentionally or unintentionally, from the moment of ignition of the first-stage boosters.<sup>21</sup>

In the spirit of the Liability Convention as an example of victim-oriented law, it is suggested that the interpretation of space object ought to be “liberal...in favour of an innocent victim.”<sup>22</sup> Hence, ‘space objects’ should be given a broad interpretation to include objects constructed or assembled in outer space under the regime of the Liability Convention to ensure that States do not ignore the law by constructing or assembling their space objects in outer space.<sup>23</sup> This is important to address issues arising from the status of satellites whose components have been derived from functional parts of ‘space debris’ salvaged or serviced in outer space. It is not a technologically distant dream because the goal of the Phoenix program under the aegis of the United States Defence Advanced Research Projects Agency is focused on recycling space assets by 2015.<sup>24</sup>

With the above understanding of the legal definition of a ‘space object,’ the following sub-section will focus on the definition and attributes of space debris, for the purposes of performing active debris remediation.

## 2.2 Defining ‘Space Debris’

Unanimously adopted at its 66<sup>th</sup> conference in 1994, the International Law Association’s International Instrument on Space Debris<sup>25</sup> was the first international attempt to provide a legal definition of ‘space debris.’ In the first article on definitions, space debris has been defined in paragraph (c) as, “man-made objects in outer space, other than active or otherwise useful satellites, when no change can reasonably be expected in these conditions in the foreseeable future.”<sup>26</sup>

The Technical Report on Space Debris was published in 1999 as a product of the multi-year work plan 1996-1998 of the Scientific and Technical (S&T) Subcommittee of the UN COPUOS. It was one of the earliest United Nations documents on space debris which served as a basis for further deliberations on the topic of congestion in the space environment. It reports the following definition proposed at the 32<sup>nd</sup> session of the S&T Subcommittee for the sake of a common understanding of the term ‘space debris.’

“Space debris are all manmade objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized.”<sup>27</sup>

In 2002, pursuant to its charter, the IADC developed the ‘IADC Space Debris Mitigation Guidelines’ based on the fundamental principles present in the national policies of the member agencies and were agreed to by consensus.<sup>28</sup> The definition of space debris contained therein was an abbreviated form of the above-mentioned definition, which was later borrowed verbatim in the United Nations Space Debris Mitigation Guidelines. The publication of the IADC Guidelines prompted the S&T Subcommittee of the UN COPUOS to create a Space Debris Working Group,<sup>29</sup> which produced a draft set of “high-level qualitative guidelines” based on the work of the IADC.<sup>30</sup> This draft was adopted by the UN COPUOS in 2007 and endorsed by the General Assembly later that year through Resolution 62/217.<sup>31</sup> The definition of space debris provided in the UN COPUOS Guidelines is as follows:

“All man-made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional.”<sup>32</sup>

It is interesting to note that the definition of ‘space debris’ is not contained in any of the actual Guidelines but it is included in the introductory section entitled ‘Background’ of the document. Further, it is important to bear in mind that this definition is explicitly limited to the purpose of this document by a preceding proviso.<sup>33</sup>

Although the General Assembly has declared that the UN Guidelines “reflect the existing practices as developed by a number of national and international organizations,” the legal status of the Guidelines are amply clear insofar as it states, in no uncertain terms, that “They are not legally binding under international law.”<sup>34</sup> It further states that “Member States and international organizations should *voluntarily* take measures...to ensure that these Guidelines are implemented.”<sup>35</sup> (emphasis added) It is evident that these Guidelines reflect technical best practices. The technical nature of the Guidelines is underscored over its legal implications by the fact that they were adopted solely by the S&T Subcommittee without any involvement or contribution from the Legal Subcommittee.

Thus, the definition of space debris enshrined in the UN Guidelines can be classified as ‘soft law.’<sup>36</sup> Although soft law is said to lack “the requisite normative content to create enforceable rights and obligations,”<sup>37</sup> they are, nonetheless, capable of producing certain legal effects.<sup>38</sup> It is not only considered as an “expression of emerging notions of

an international public order,<sup>39</sup> but it also constitutes “an important element in the progressive institutionalization of international cooperation.”<sup>40</sup> Hence, the definition of ‘space debris’ contained in these Guidelines reflect a relatively less obligatory approach, which helps to balance the conflicting priorities of the space players<sup>41</sup> and to establish a minimal standard of care for States in the realm of debris mitigation and remediation measures.

### 2.3 Decommissioning of Envisat

On 8 April 2012, ESA lost contact with Envisat, the largest non-military earth observations satellite in orbit.<sup>42</sup> After several failed attempts to regain control of the satellite, ESA declared the end of its mission on 9 May 2012.<sup>43</sup>

It is currently drifting uncontrolled in a sun-synchronous polar orbit and is being tracked by the U.S. Joint Space Operations Centre. Its enormous size – ten metres in length and five metres in width, with an even larger solar array and weighing 8 tons – aggravates the concern of its collision with other functional space objects.<sup>44</sup> It has been estimated that given its orbit and area-to-mass ratio, it will take 150 years for natural decay through atmospheric drag.<sup>45</sup> ESA has calculated a 30 percent collisional probability with other orbital debris in this duration.<sup>46</sup> Therefore, it is potentially an ideal candidate for removal from orbit.<sup>47</sup>

In this case, the question arises whether Envisat can be qualified as ‘space debris.’ Although it is drifting uncontrolled and is no longer manoeuvrable due to loss of communications, it is otherwise an intact satellite. Further, if technological development allows re-establishing communications with it, as in the case of the Intelsat Galaxy-15 satellite, then Envisat can be re-commissioned back to service as a ‘space object’.

### 2.4 Analysis

It has been rightly pointed out by the 2006 IAA Cosmic Study on Space Traffic Management that “no legal distinction is made between valuable active space-craft and valueless space debris.”<sup>48</sup> It further recommended the UN COPUOS to “start discussing whether or not space debris are space objects in the sense used in space law. If it is decided that space debris are space objects, an additional protocol should be elaborated stating what provisions of the treaties apply to valuable spacecraft and which provisions apply to space debris. If it is decided that space debris are not space objects, the protocol should determine under what conditions space debris may be removed

or re-orbited in order to prevent collisions or close encounters with valuable spacecraft.”<sup>49</sup>

The formulation of a “transparent and reasonable selection matrix on the basis of which objects are targeted”<sup>50</sup> is a prudent method to ascertain which space objects can be designated as targets for removal. In the wide gamut of views put forth by experts,<sup>51</sup> the consensual opinion seems to be based on the common denominator of “the ability of the man-made instrumentality to traverse in outer space.”<sup>52</sup> Hence, the manoeuvrability or functionality of the space object is key to determining its status as space debris so that it can be classified as a target for remediation.

While a fresh legislative endeavour in the form of an additional protocol or a separate treaty to address this situation is the easiest and ideal solution,<sup>53</sup> our current geo-political environment is not conducive for such an approach due to the competing interests and priorities of different States. Hence, it is essential to investigate a pragmatic alternate resolution to this problem through optimal utilization of the already available resources, that is, to effectuate a broader interpretation of the existing legal principles in order to accommodate the rapidly changing commercial and environmental realities of activities conducted in outer space.

## 3. STATE RESPONSIBILITY FOR SPACE DEBRIS REMEDIATION

Due to the absence of a legal status granted to space debris, orbital remedial activities give rise to a plethora of regulatory complexities and unanswered legal questions. Imagine the following hypothetical scenario: Conjunction analysis has identified an uncontrolled satellite, X belonging to State A as a high-probability threat to a functional satellite, Y belonging to State B, which attempts to deorbit X without authorization from State A. Due to technical anomalies, it erroneously incapacitates another satellite belonging to State A. In the meanwhile, State A manages to successfully revive satellite X and manoeuvre it back to its allotted orbit.

Is State A under an international legal obligation to avoid causing damage to another State’s space assets? Is State B justified in exercising jurisdiction and control over satellite X to avoid collision with its own space asset? What are the legal implications of unauthorized active debris removal?

State responsibility has been viewed as “a legal construct that allocates risk for the consequences of acts deemed wrongful by international law to the artificial entity of the State.”<sup>54</sup> The distinction between State responsibility and liability lies in the fact that the

prerequisite to the former is an act breaching international law and to the latter, the harmful effects of an activity, which is not *per se* a violation of international law.<sup>55</sup> In international space law, while responsibility applies to a “State’s obligation to regulate and control space activity both in the present, and in the future, to assure compliance with not only the letter but the spirit of the Outer Space Treaty principles”, liability on the other hand refers to an “obligation of a State to compensate for damages”.<sup>56</sup>

As has been observed by Cheng, international state responsibility in the outer space field arises the moment a breach of an international obligation is produced and not when the State is seen to have failed in its duty to prevent or repress such breach, for the State is immediately accountable for the breach on the international plane as if it itself had breached the international obligation.<sup>57</sup>

### 3.1 International Responsibility: Article VI, Outer Space Treaty

The vital question of responsibility over space objects is addressed in *lex spatialis*, first in the 1963 Declaration of Legal Principles and then in the 1967 Outer Space Treaty. At the time of its adoption, the Outer Space Treaty represented “the lowest common denominator of issues on which consensus existed in COPUOS.”<sup>58</sup> This sentiment was reflected in the views of the then U.S. Secretary of State, who had described the legislative efforts behind the conclusion of the Outer Space Treaty as an “outstanding example of how law and political arrangements can keep pace with science and technology.”<sup>59</sup> As of 1 January 2014, the Outer Space Treaty has been ratified by 103 States and signed by 25 signatories.<sup>60</sup> It is noteworthy that all spacefaring States so far have ratified the Treaty which indicates that some of its provisions have likely crystallized into customary international law.<sup>61</sup>

The possible involvement of private enterprises in outer space and the attribution of responsibility for such private activities to the States had been one of the controversial issues between the U.S.A. and the erstwhile Soviet Union during the development of a legal regime governing outer space activities.<sup>62</sup> Principle 5 of the United Nations General Assembly Resolution 1962(XVIII) reflected the compromise reached between the two parties by allowing private participation in space activity subject to the control of the “appropriate State” and imposing consequent international responsibility on the State for such activities.<sup>63</sup> It was later incorporated in Article VI of the 1967 Outer Space Treaty. On deconstructing this

article, it is clear that the following obligations are imposed on States:<sup>64</sup>

- (i) to bear responsibility for national activities in outer space regardless of whether such activities are carried out by public or private entities;
- (ii) to assure that national activities are conducted in conformity with the Outer Space Treaty and, through Article III, with international law;
- (iii) to authorize and continually supervise, where appropriate, the activities of nongovernmental entities in outer space; and
- (iv) to share international responsibility for the activities of international organizations of which the State is a participant.

The scope of this paper is to examine the space behaviour of States as subjects of public international law and *a fortiori*, international space law. The regulatory concerns about the activities of private actors will not be addressed because ultimately, States shall “bear international responsibility” for such activities, which “require authorisation and continuing supervision” by the appropriate State under the dictate of Article VI of the Outer Space Treaty. Hence, this paper will explore the duties and responsibilities of States as members of the international space community and their legal rights and obligations for space debris remediation conducted under their national jurisdiction and control.

The extent of obligation as far as damage to third parties is concerned is the international responsibility of the obligation to control; in particular to make sure that the obligations set by Article III (activities must be carried on according to international law, including the Charter of the United Nations as *lex generalis*) and Article VI (activities must be carried on according to the Outer Space Treaty as *lex specialis*) of the Outer Space Treaty are implemented.<sup>65</sup>

In the event of a space debris remediation activity, it can be inferred from Article VII of the Outer Space Treaty that although the remediation might be conducted by a third party, the launching State of the space object in question would continue to entail international responsibility for any damage caused by it. While international law does not explicitly impose an obligation to avoid causing damage to another State’s space assets, there is an underlying duty to observe a standard of care or due diligence in performance of its activities. With a view towards balancing the conflicting State interests in its 1978

report,<sup>66</sup> the Working Group to the International Law Commission noted that “the essential obligation owed by a State in such a context has tended to be conceived as one of moderation, or of care or due diligence, in relation to its own activities or of private activities within its jurisdiction or control.”<sup>67</sup> It was emphasized in the Special Rapporteur’s report that “treaty regimes of a universal character, dealing with acts not prohibited by international law, had been established in relation to,” among other issues, the regulation of “space objects.”<sup>68</sup>

It is stated in Special Rapporteur Baxter’s first report on international liability for injurious consequences arising out of acts not prohibited by international law in 1980:

“Depending upon the circumstances, the standard of reasonable care or due diligence may well require a standard more exacting than its own as part of a special regime of protection that includes guarantees of redress for the potential victims of any hazard that cannot be wholly eliminated.”<sup>69</sup>

He goes on to clarify the controversy regarding the absence of a standard of care in space law with the following remarks:

“[T]he regime of absolute liability provided in the [Liability Convention] may be regarded not only as an applicable conventional rule, but also as evidence of the standard of care which the authors of the Convention believed to be reasonable in relation to that particular activity.”<sup>70</sup>

### 3.2 Need for Consent

The existing framework of international space law does not authorize interception with space objects without the prior consent of the launching State. In the case of a removal of an object without the authorization, it would constitute an internationally wrongful act.

However, prior consent obtained from the launching State, or the State of registry in the case of multiple launching States, would constitute a circumstance precluding the wrongfulness of conduct that would otherwise not be in conformity with the international obligations of the State performing the remedial activity. It has been opined by the ICJ that the existence of such a circumstance does not annul or terminate the obligation; rather it provides a justification or excuse for non-performance while the circumstance in question subsists.<sup>71</sup>

Article 20 of the International Law Commission’s Articles on State Responsibility reflects the basic international law principle of consent:

“Valid consent by a State to the commission of a given act by another State precludes the wrongfulness of that act in relation to the former State to the extent that the act remains within the limits of that consent.”

In accordance with this principle, consent by a State to particular conduct by another State precludes the wrongfulness of that act in relation to the consenting State, provided the consent is valid and to the extent that the conduct remains within the limits of the consent given. Validity of the consent must be assessed to ensure that it is freely given and clearly established. It must be actually expressed by the State rather than merely presumed on the basis that the State would have consented if it had been asked. It must also not be vitiated by the influence of error, fraud, corruption or coercion.<sup>72</sup>

## 4. STATE JURISDICTION AND CONTROL OVER SPACE OBJECTS

The term ‘jurisdiction’ has been described as “the lawful power of a State to define and enforce the rights and duties, and control the conduct, of natural and juridical persons.”<sup>73</sup> It is “the power of the state under international law to regulate or otherwise impact upon people, property and circumstances and reflects the basic principles of state sovereignty, equality of states and non-interference in domestic affairs.”<sup>74</sup>

Eminent jurist, Judge Manfred Lachs has defined jurisdiction as “a basic attribute of a State, whereby it exercises fundamental powers as a subject of international law.”<sup>75</sup> He has qualified the limits upon the exercise of such jurisdiction as “determined by the rights of other States and the requirements of cooperation in international relations.”<sup>76</sup>

This section contains a survey of the identical and uniform treatment bestowed on the twin concepts of ‘jurisdiction and control’ over space objects in international space law followed by some additional comments on related concepts such as ownership and registry of space objects.

### 4.1 Jurisdiction and control

Article VIII of the Outer Space Treaty relates to jurisdiction and control over a space object by a State through launching of the space object. It provides that:

“A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such

object, and over any personnel thereof, while in outer space or on a celestial body.”<sup>77</sup> (emphasis added)

Some commentators have suggested a conceptual distinction between ‘jurisdiction’ and ‘control’ insofar as describing ‘control’ in terms of a separate technical function – “a separate concept, to mean not only observation (passive) but, in the first place, an obligation for the State of Registry, to active guidance of the space object; and a prohibition of interference with the space object by a third (non-Registry) State.”<sup>78</sup> The Soviet authors have further expanded the concept to include “activities of special services of the State of Registry aimed at monitoring the technical condition of the space object during the launching and putting into orbit, as well as its functioning in outer space and during the landing.”<sup>79</sup> It is unnecessary to dissect the twin concepts of ‘jurisdiction and control’ that have received identical and uniform treatment throughout international space law instruments. Hence, it has been rightly pointed out that “jurisdiction should induce control and control should be based on the jurisdiction.”<sup>80</sup>

In the context of this discussion, it is important to simultaneously take into account the provisions of the Registration Convention because it is viewed as an attempt towards further elaboration of Article VIII of the Outer Space Treaty.<sup>81</sup> Article II(2) of the Registration Convention provides that:

“Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object..., bearing in mind the provisions of article VIII of the [Outer Space Treaty], and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.”

In order to exercise legitimate jurisdiction, it is essential for the State to identify a “sufficient nexus between itself and the object of its assertion of jurisdiction.”<sup>82</sup> There is wide scholarly consensus that registration of space objects establishes such a link between the State and the space object.<sup>83</sup> In case if a space object is not registered, it has been observed that ownership serves as the determining factor to ascertain which State could exercise jurisdiction and control.<sup>84</sup>

However, some authors do not consider registration as a “legal confirmation of ownership” or a “binding legal commitment of liability” on the ground that the State of registry may not be the launching State.<sup>85</sup> The

State of registry has been defined in the Registration Convention as “a launching State on whose registry a space object is carried...”<sup>86</sup> It follows that the State of registry, therefore, has to be one of the launching States, that is, a State which launches or procures the launching of a space object or a State from whose territory or facility a space object is launched.<sup>87</sup>

In the wake of increasing international collaborative space ventures and private participation, the election of a State of registry among multiple launching States for the purpose of retention of jurisdiction and control is likely more complicated than it may appear. The State whose national is the owner of the payload/satellite will be more interested in acquiring legitimate jurisdiction and control rather than the State from whose territory/facility the launch had taken place. Although State practice with respect to the registration of space objects is sometimes sketchy and seemingly inconsistent, clarifying declarations by spacefaring States help to eliminate the ambiguities.<sup>88</sup>

From the above discussion, it is apparent that public international space law is silent about the legality of remediation when it relates to assuming or transferring legal jurisdiction and control of a particular space object. In the event of a remediation carried out by a State or a State licensed actor, it will be considered legitimate if the State retains *de jure* jurisdiction and control of that space object or obtains explicit authorization from the State of registry. Thus, no legal complications are anticipated when a State seeks to remediate its own space objects. However, when a State or State licensed actor seeks to remediate a space object that it did not carry on its registry, the question will arise whether there can be an exception to this general rule of jurisdiction and control on grounds of the public policy goal of facilitating space debris remediation to avoid orbital congestion and ensure long-term sustainability of outer space.

#### 4.2 Transfer of Registration

Neither the Outer Space Treaty nor the Registration Convention contains any provisions for the transfer of the registration of a space object. Consequently, this has generated extensive academic debate about the validity of such transfer agreements. The process of privatization of the International Maritime Satellite Organization (INMARSAT) had highlighted this issue.<sup>89</sup>

Before proceeding to examine this issue in greater detail, it is important to take note of the language in Article II of the Registration Convention, which lays down that space objects can be registered by launching states only.

Several commentators have argued in favor of an amendment to the Registration Convention to resolve the challenges arising from transfer of registration of a space object. However, existing State practice demonstrates otherwise where non-launching States have successfully registered space objects over which they retain jurisdiction and control pursuant to Article VIII of the Outer Space Treaty. This was evident in the transfer of satellites registered in the United Kingdom to China as a consequence of the handover of Hong Kong in 1998.<sup>90</sup> This is consistent with Article II because it does not prohibit subsequent transfers of jurisdiction and control rights among launching States.<sup>91</sup>

However, the Registration Convention does not explicitly regulate subsequent transfers of jurisdiction and control rights to non-launching States. The *note verbale* submitted by the Netherlands to the UN COPUOS to register the transfer of ownership of satellites from New Skies Satellites is particularly interesting because it expressly renounces the status of the launching State or the State of Registry and consequently rejected its obligation to furnish information under Article IV of the Registration Convention. However, by virtue of the in-orbit transfer of ownership, it assumed international responsibility under Article VI of the Outer Space Treaty and also claimed the retention of jurisdiction and control under Article VIII of the Outer Space Treaty.<sup>92</sup>

It is also noteworthy that the principle of ‘treaty stipulations in favor of third States’ is well-recognized in customary international law. It allows States to enter into agreements conferring actual rights of their own to a third State, which can then exercise such a right upon compliance with the conditions of its exercise. It has been codified in Article 36 of the Vienna Convention on the Law of Treaties<sup>93</sup> and has been substantiated by international jurisprudence espoused by the world courts<sup>94</sup> and juristic opinion in favor of it.<sup>95</sup> Therefore, launching States may enter into specific agreements with non-launching States to lawfully transfer the right to jurisdiction and control over a space object.

The language in Article II of the Registration Convention unambiguously imposes a positive obligation on launching States to register the space object. However, in the event of transfer of ownership to a non-launching State, such a right to register the space object can be found in Article VIII of the Outer Space Treaty for domestic registrations and General Assembly Resolution 1721B (XVI)<sup>96</sup> for registration with the United Nations. Hence, this eliminates any

need for an amendment of the Registration Convention and the transfer of ‘jurisdiction and control’ can be carried out under the existing framework of space law.

#### 4.3 Ownership

Under the current legal regime, ownership of space objects is not co-extensive with the jurisdiction and control over such objects. Article VIII of the Outer Space Treaty states that:

“Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, *is not affected* by their presence in outer space or on a celestial body or by their return to the Earth.” (emphasis added)

While ‘jurisdiction and control’ is clearly geo-spatial in nature as it can be retained “while in outer space or on a celestial body,” ‘ownership’ is in perpetuity as it “is not affected by their presence in outer space or on a celestial body or by their return to the Earth.”<sup>97</sup> The law is silent about the temporal factor of ‘jurisdiction and control’ as to when can a State relinquish *de jure* jurisdiction and control. This is particularly important in cases when a State of registry has lost *de facto* control over a space object due to a technical anomaly which has rendered the space object non-functional and consequently, a potential target for remediation.

It is important to bear in mind that Article VIII of the Outer Space Treaty enjoins the State of Registry to retain its jurisdiction and control over the space object. More so, it cannot be abandoned after the expiry of its functional phase because Article VIII grants ownership in perpetuity, which ties the State of Registry to bear international responsibility and liability for any damage caused by its space object, pursuant to Article VII of the Outer Space Treaty, even though it is no longer operational or controllable.

While this provision has been alleged as an impediment towards space debris remediation activities,<sup>98</sup> it is, in fact, not an inhibiting factor as States can enter into separate agreements for the transfer of ownership of space objects as discussed in the preceding section. Thus, although international space law does not contain explicit provisions for the transfer of registry, public international law jurisprudence coupled with contemporary State practice have circumvented that lacuna through conclusion of bilateral or multi-lateral agreements. Therefore, it would be misleading to make an unequivocal assertion that space debris remediation activities are being thwarted by the ‘ownership’ clause in the Outer Space Treaty.



## **5. CONCLUDING REMARKS**

From the above discussion, it has been observed that public international law jurisprudence developed over the years can effectively resolve the unanswered questions arising from space debris remediation and principles from public international law can be relied upon to address the lacunae in the legal fabric of international space law.

The next step is for the international community, particularly the established space actors, to engage in

discourse for developing State practice and legal and policy guidelines on space debris remediation. Given the lack of political will on the international level towards encouraging remedial activity, it might be prudent for the major space players to undertake unilateral action and also proactively encourage responsible space behaviour amongst their licensed private entities to expedite organizational and operational aspects of space debris remediation.

1 Terms of Reference for the Inter-Agency Space Debris Coordination Committee (IADC), online: [http://www.iadc-online.org/index.cgi?item=torp\\_pdf](http://www.iadc-online.org/index.cgi?item=torp_pdf). “The primary purpose of the IADC is to exchange information on space debris research activities between member space agencies, to facilitate opportunities for cooperation in space debris research, to review the progress of ongoing cooperative activities and to identify debris mitigation options.”

2 IADC Space Debris Mitigation Guidelines (2002) (hereinafter IADC Guidelines), online: [http://www.iadconline.org/docs\\_pub/IADC-101502.Mit.Guidelines.pdf](http://www.iadconline.org/docs_pub/IADC-101502.Mit.Guidelines.pdf).

3 *Report of the Scientific and Technical Subcommittee on the Work of its Forty-fourth Session*, UNCOPUOS, 50<sup>th</sup> Sess, UN Doc A/AC.105/890 (2007) at para 99.

4 *Report of the Committee on the Peaceful Uses of Outer Space*, UNGAOR, 62<sup>nd</sup> Sess, Supp No 20, UN Doc A/62/20 (2007) at para 118-119.

5 Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, as annexed to UN doc. A/62/20, Report of the COPUOS (2007) at 1.

6 Michael Stoiko, *Soviet Rocketry: Past, Present, and Future* (Holt, Rinehart & Winston, 1970) at 79.

7 Interagency Report on Orbital Debris (Office of Science and Technology Policy, U.S. National Science and Technology Council, Washington, DC, 1995); *Technical Report on Space Debris*, text of the Report adopted by the Scientific and Technical Subcommittee of the United Nations Committee on Peaceful Uses of Outer Space, UN Doc A/AC.105/720 (New York: United Nations, 1999) (hereinafter *Technical Report on Space Debris*).

8 “International Space Station Again Dodges Debris” (2011) 15 *Orbital Debris Quarterly News* 1, online: <http://www.orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv15i3.pdf>

9 J.-C. Liou, N.L. Johnson, “Instability of the present LEO satellite populations” (2008) 41 *Adv. Space Res.* 1046; J.C. Liou & Nicholas L. Johnson, “Risks in Space from Orbiting Debris” (2006) 311 *Science* 340-341, online: <http://www.sciencemag.org/content/311/5759/340.full> Generally, see J.C. Liou, “A Note on Active Debris Removal” (2011) 15 *Orbital Debris Quarterly News* 7, online: <http://www.orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv15i3.pdf> at 7-8.

10 For distinction between ‘space object’ and ‘space debris,’ see Luboš Perek, “Ex Factor Sequitur Lex: Facts which Merit Reflection in Space Law in Particular with Regard to Registration and Space Debris Mitigation” in Marietta Benkő & Kai-Uwe Schrogl, *Space Law: Current Problems and Perspectives for Future Regulation* (Utrecht: Eleven International, 2005) at 40-43.

11 Arnel Kerrest, “Liability for Damage Caused by Space Activities” in Marietta Benkő & Kai-Uwe Schrogl, *Space Law: Current Problems and Perspectives for Future Regulation* (Utrecht: Eleven International, 2005) at 97-98; S. Gorove, “Legal and Policy Issues of the Aerospace Plane” (1988) 16 *J. Space L.* 147 at 154; Julian G. Verplaetse, “On the Definition and Legal Status of Spacecraft” (1963) 29 *J. Air L. & Com.* 131.

12 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 610 UNTS 205 (hereinafter Outer Space Treaty).

13 Convention on International Liability for Damage Caused by Space objects, 29 March 1972, 961 UNTS 187 (hereinafter Liability Convention).

14 S.B. Rosenfield, "Where Air Space Ends and Outer Space Begins" (1979) 7 J. Space L. 137 at 145.

15 Annex to art. 19, UNTS 507 at 205. Also, see J.A.C. Gutteridge, "The United Nations Committee on the Peaceful Uses of Outer Space" in *Current Problems in Space Law: A Symposium* (British Institute of International and Comparative Law, Holland, 1986) at 36.

16 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, UN GA Res. 1962 (XVIII) 13 December 1963.

17 Liability Convention, art I(d). See Bess C.M. Reijnen, *The United Nations Space Treaties Analysed* (Editions Frontieres, 1992) at 182-83.

18 Convention on Registration of Objects Launched into Outer Space, 29 November 1971, UN GA Res. 3235 (XXIX) (hereinafter Registration Convention).

19 Mathias Forteau, "Space Law" in James Crawford, et al (eds.), *The Law of International Responsibility*, (Oxford University Press, 2010) at 906.

20 Outer Space Treaty, art VIII.

21 H.A. Baker, "Liability for Damage Caused in Outer Space by Space Refuse" (1988) 12 Ann. Air & Sp. L. 183 at 225.

22 T.E. Wolcott, "Some Aspects of Third Party Liability in Space Shuttle Operations" (1980) 13 Akron L.R. 613 at 617.

23 Bruce A. Hurwitz, *State Liability for Outer Space Activities in Accordance with the 1972 Convention on International Liability for Damage Caused by Space Activities*, (Martinus Nijhoff, 1992) at 23-24. This conclusion is supported by the 1980 NASA Authorization Act which defines "space vehicle" as "an object intended for launch, launched or assembled in outer space, including the Space Shuttle and other components of a space transportation system [the official designation of the Shuttle], together with related equipment, devices, components and parts." National Aeronautics and Space Administration Authorization Act, 1980, Pub. L. No. 96-48, 93 Stat. 348 (1979), Section 308 – Insurance and Indemnification at Sec. 308(f), quoted by G.J. Mossinghoff, "Managing Tort Liability Risks in the Era of the Space Shuttle" (1979) 7 J. Space L. 121 at 127-128. Emphasis added.

24 David Barnhart, Program Manager, Tactical Technology Office, "DARPA's Phoenix Project" presented at the NASA Second International Workshop on On-Orbit Satellite Servicing (May 2012), online: [http://ssco.gsfc.nasa.gov/workshop\\_2012/McGuirk\\_final\\_presentation\\_2012\\_workshop.pdf](http://ssco.gsfc.nasa.gov/workshop_2012/McGuirk_final_presentation_2012_workshop.pdf).

25 The ILA Finalizes its International Instrument on Space Debris in Buenos Aires, August 1994, (1995) 23 J. Space L. 47.

26 For the text of the instrument, see Karl-Heinz Böckstiegel, "ILA Draft Convention on Space Debris" (1995) 44 ZLW 29.

27 *Technical Report on Space Debris*, note 7 at 2, para. 6.

28 IADC Mitigation Guidelines, note 2. These have been elaborated upon by *Support to the IADC Space Debris Mitigation Guidelines* (2004), online: [http://www.iadconline.org/docs\\_pub/IADC.SD.AI20.3.10.2004.pdf](http://www.iadconline.org/docs_pub/IADC.SD.AI20.3.10.2004.pdf).

29 *Report of the Scientific and Technical Subcommittee on the Work of its Forty-First Session*, UN COPUOS, UN Doc. A/AC.105/823, 2004 at 20.

30 *Progress Report of the Working Group on Space Debris, Submitted by the Chairman of the Working Group*, UN COPUOS, UN Doc. A/AC.105/C.1/L.284, 2006, at 2.

31 GA Res 62/217, 21 December 2007, 'International cooperation in the peaceful uses of outer space,' para 26. In GA Res 63/90, 5 December 2008, the General Assembly invited States to 'implement' these Guidelines (para 26).

32 Space Debris Mitigation Guidelines, note 5.

33 *Ibid.*

34 *Ibid.*, section 3, para. 2.

35 *Ibid.*, section 2.

36 Joseph Gold, "Strengthening the Soft International Law of Exchange Agreements" (1983) 77 AJIL 443; Christine Chinkin, "A Hard Look at Soft Law" (1988) Proceedings ASIL 371, at 389; C. Schreuer, "Recommendations and the Traditional Sources of International Law" (1977) 20 German Yearbook of Int'l Law 103.

37 Francesco Francioni, "International 'Soft Law': A Contemporary Assessment" in Vaughan Lowe and Malgosia Fitzmaurice (eds.), *Fifty Years of the International Court of Justice, Essays in Honour of Sir Robert Jennings* (Cambridge University Press, 1996) at 168.

38 "A Hard Look at Soft Law" (1988) 82 Am. Soc'y Int'l L. Proc. 371

39 Ibid.

40 Francioni, "International 'Soft Law', note 37, at 178.

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49 Corinne Contant-Jorgenson, Petr Lála & Kai-Uwe Schrogl, "Report: The IAA Cosmic Study on space traffic management" (2006) 22 Space Policy 283 at 287.

50 Jan Helge Mey, "Space Debris Remediation: Some Aspects of International Law Relating to the Removal of Space Junk from Earth Orbit" (2012) 61 ZLW 251 at 271.

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53 Thierry Senechal, "Orbital Debris: Drafting, Negotiating, Implementing a Convention," Master's thesis, Massachusetts Institute of Technology (2007)

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55 Rebecca M. M. Wallace, *International Law*, (Sweet & Maxwell, 2003) at 203.

56 W. B. Wirin, "Practical Implications of Launching State – Appropriate State Definitions", (1994) 37 Proc. of Colloq. on the Law of Outer Sp. at 109.

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60 Status of International Agreements Relating to Activities in Outer Space as at 1 January 2014, A/AC.105/2014/CRP.7, online: United Nations Office of Outer Space Affairs [http://www.oosa.unvienna.org/pdf/limited/c2/AC105\\_C2\\_2014\\_CRP07E.pdf](http://www.oosa.unvienna.org/pdf/limited/c2/AC105_C2_2014_CRP07E.pdf).

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63 Carl Q. Christol, *The Modern International Law of Outer Space*, (New York: Pergamon Press, 1982) at 65.

64 Ricky Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space*, (Springer, 2012) at 128.

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66 “On the one hand there is the benefit to be obtained by the State conducting the activity, but on the other hand there is the injury inflicted on the foreign State as a result of the conducting of that same activity.” Hurwitz, *State Liability for Outer Space Activities*, note 23, at 147.

67 ILC Yearbook 1978, vol. II, part two, at 151 (Para 19)

68 Preliminary report on international liability for injurious consequences arising out of acts not prohibited by international law. Doc A/AC.4/344 and Add. 1 and 2. Reprinted in ILC Yearbook 1980, Vol. II, part one (Para 4). The law of outer space was included within the category of “recent materials that are, or may be, relevant to the development of a new topic.” ILC Yearbook 1978, vol. II, part two, at 150 (Para. 12) Also, see Setsuko Aoki, “The Standard of Due Diligence in Operating a Spacecraft” (2012) 55 Proc. of Colloq. on L. of Outer Sp.

69 Preliminary report on international liability for injurious consequences arising out of acts not prohibited by international law, by Mr. Robert Q. Quentin-Baxter, Special Rapporteur, A/CN.4/334 and Add.1 & Corr.1 and Add.2, reproduced in *ILC Yearbook* (1980) Vol. II (1) at 252.

70 Ibid.

71 *Gabcikovo-Nagymaros Project (Hungary/Slovakia)*, I.C.J. Reports 1997, at 39, para. 48.

72 ILC Articles on State Responsibility, Commentary to Art. 20, at 175

73 Bernard H. Oxman, “Jurisdiction of States” in R. Bernhardt (ed.), *Encyclopedia of Public International Law*, Vol. 1 (Elsevier, 1992) at 55.

74 Malcolm N. Shaw, *International Law*, 6<sup>th</sup> ed., (Cambridge University Press, 2008) at 645. Generally, see M. Akehurst, “Jurisdiction in International Law” (1972) 46 BYIL 145; F. A. Mann, “The Doctrine of Jurisdiction in International Law” (1964) 111 HR 1; F. A. Mann, “The Doctrine of Jurisdiction in International Law Revisited After Twenty Years” (1984) 186 HR 9; D. W. Bowett, “Jurisdiction: Changing Problems of Authority over Activities and Resources” (1982) 53 BYIL 1; I. Brownlie, *Principles of Public International Law*, 6th edn, Oxford, 2003, chapters 14 and 15; O. Schachter, *International Law in Theory and Practice*, Dordrecht, 1991, chapter 12; R. Higgins, *Problems and Process*, Oxford, 1994, chapter 4.

75 Manfred Lachs, *The Law of Outer Space* (Leiden: Sijthoff Publishers, 1972) at 69.

76 Ibid. Also, see Manfred Lachs, “The International Law of Outer Space” (1964) 113 RdC at 58.

77 Outer Space Treaty, Article VIII.

78 Bess C.M. Reijnen, *The United Nations Space Treaties Analysed* (Editions Frontieres, 1992) at 119.

79 Ibid.

80 Gabriel Lafferranderie, “Jurisdiction and Control of Space Objects and the Case of an International Intergovernmental Organisation (ESA)” (2005) 54 ZLW 228 at 231-232.

81 Registration Convention, preamble.

82 Bernard H. Oxman, “Jurisdiction of States” in R. Bernhardt (ed.), *Encyclopedia of Public International Law*, Vol. 1 (Elsevier, 1992), at 56. “The requisite contacts with a State necessary to support the exercise of jurisdiction differ depending on the nature of the jurisdiction being exercised.”

83 “Registration of space objects seem *ipso facto* to be sufficient to provide the link between these objects of international law and the subjects of international law.” Stephan Hobe, “Spacecraft, Satellites and Space Objects” Max Planck Encyclopedia of Public International Law; “This link has a double intention. On the one hand, it assures to the spacecraft the protection by the State; on the other hand, the interests of third persons are protected by the fact that the State will be responsible for the spacecraft belonging to this State.” I.H.Ph Diederiks-Verschoor, “Registration of Spacecraft” in E. McWhinney & M.A. Bradley (eds.), *New Frontiers in Space Law* (Leiden, 1969) at 125.

84 “Failing registration, the act of launching and the ownership of such space objects seem to provide a sufficient link.” Stephan Hobe, “Spacecraft, Satellites and Space Objects,” *ibid.*

85 Henry R. Hertzfeld & Ben Baseley-Walker, “A Legal Note on Space Accidents” (2010) 59 ZLW 230 at 233

86 Registration Convention, Art. I(c)

87 Liability Convention, Art. I(c); Registration Convention, Art I(a); Outer Space Treaty, Art. VII.

88 Kenneth Hodgkins, U.S. Adviser to the 57th Sess, of the UN General Assembly, *International Cooperation in the Peaceful Uses of Outer Space*, Remarks on Agenda Item 75 in the Fourth Committee of the United Nations General Assembly, New York, 9 October 2002, online: <http://2001-2009.state.gov/g/oes/rls/rm/2002/14362.htm>. “We intend to include on the U.S. registry all space objects that are owned or operated by U.S. private or governmental entities whether launched from inside or outside U.S. territory. In general, the United States will not include on its registry non-U.S. payloads that are launched from U.S. territory or facilities. It is our view that such non-U.S. payloads should be included on the registry of the State of the payload’s owner/operator because that State is best positioned to exercise jurisdiction and control. In addition, we will continue our practice of including certain non-functional objects on the U.S. Registry.”

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90 Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space, *Note verbale* dated 27 March 1998 from the Permanent Mission of the United Kingdom of Great Britain and Northern Ireland to the United Nations (Vienna) addressed to the Secretary-General, UN Doc. ST/SG/SER.E/333 – Notification of the removal of AsiaSat-1 (1990-030A), APSTAR-I (1994-043A), Asiasat-2 (1995-064A) and APSTAR IA (1996-039A) from national register effective 1 July 1997. Also see UN Doc. ST/SG/SER.E/334 for notification of addition of above named satellites to the register of the Hong Kong Special Administrative Region of the People's Republic of China effective 1 July 1997.

91 Ricky J. Lee, “Effects of Satellite Ownership Transfers on the Liability of the Launching State” (2000) 43 Proc. Of Colloq. On Law of Outer Sp. 148.

92 UN Doc. A/AC.105/806 (22 August 2003).

93 Vienna Convention on the Law of Treaties, 1155 UNTS 331; 8 ILM 679 (1969), Article 36.

Treaties providing for rights for third States

1. A right arises for a third State from a provision of a treaty if the parties to the treaty intend the provision to accord that right either to the third State, or to a group of States to which it belongs, or to all States, and the third State assents thereto. Its assent shall be presumed so long as the contrary is not indicated, unless the treaty otherwise provides.
2. A State exercising a right in accordance with paragraph 1 shall comply with the conditions for its exercise provided for in the treaty or established in conformity with the treaty.

94 *Free Zones of Upper Savoy and the District of Gex (France v. Switzerland)* [1932] P.C.I.J. (ser. A/B), No. 46 at 147.

95 E Jimenez de Arechaga, “Treaty Stipulations in Favour of Third States” (1956) 50 Am. J. Int’l L. 338; M Fitzmaurice, “Third Parties and the Law of Treaties” (2002) 6 Max Planck YUNL 37; G Napoletano, “Some Remarks on Treaties and Third States under the Vienna Convention on the Law of Treaties” (1977) 75 Italian Ybk. Int’l L. 75.

96 International co-operation in the peaceful uses of outer space, UN GA Res. 1721 (XVI), online: United Nations Office of Outer Space Affairs, [http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares\\_16\\_1721.html](http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares_16_1721.html). “Calls upon States launching objects into orbit or beyond to furnish information promptly to the Committee on the Peaceful Uses of Outer Space, through the Secretary-General, for the registration of launchings”

97 Outer Space Treaty, art VIII.

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98 Matthew Schaefer, “Analogues between Space Law and the Law of the Sea/International Maritime Law: Can Space Law Usefully Borrow or Adapt Rules from These Other Areas of Public International Law?” (2012) 55 Proc. Of Colloq. On Law of Outer Sp.