

Interpreting “Damage Caused by Space Objects” under the 1972 Liability Convention

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Abstract

Forty years have now passed since the adoption of the Liability Convention and, due to new and rapid technological developments, the massive dependence on space applications, and the growing risk of accidents, there is an increasing need to consider whether the Liability Convention and, more specifically, the definition of “damage” under article I, sufficiently provides effective legal protection. Are environmental damages on earth and in space covered? Does the notion of “the impairment to health” also include moral damages? Is recovery appropriate in cases of damage to peoples’ personality or privacy caused by the use of direct broadcasting? What about harm from the (non)-disclosure of information obtained through the use of earth observation from space? The answers to these questions are often complicated by the fact that the Liability Convention only deals with damages caused by a “space object,” whose definition is similarly unclear.

Satellite re-entries like ESA’s GOCE in November, 2013, the increasing risks connected to the proliferation of space debris, and the growing abundance of companies proposing novel ideas to develop outer space, bring the scope of liability into the spotlight again. As this utilization of outer space intensifies, so, too, do the challenging legal questions. This paper will focus on historical and modern issues related to “damage caused by space objects” with the hope of clarifying its interpretation, identifying current gaps and possible future areas that will require legal protection, and proposing amendments to the Convention that clearly identify what falls within its scope.

I. Introduction

According to article I(a) of the 1972 Liability Convention,¹ the term “damage” means, for the purpose of the Convention itself, “loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of

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1 Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, T.I.A.S. 7762, 961 U.N.T.S. 187

persons, natural or juridical, or property of international intergovernmental organizations.” This general definition leaves open the question of which damages are actually covered by the regime set by the Liability Convention. Liability for damage caused by space objects is now becoming of greater practical relevance due to the growing use of outer space technologies and the related increased risk of incidents involving space objects. Because damage awards under the Liability Convention are, in theory, unlimited,² it is all the more necessary to determine exactly what kinds of claims can be brought.

While some of the limits to the scope of the Convention were known at the time of the drafting, novel forms of damage that were not imagined at the beginning of the space era add new definitional questions to the traditional ones and must now be reconsidered. It is time to reassess whether the current legal regime is able to properly accommodate the possible scenarios that could arise today.

II. Defining “Damage Caused by Space Objects” in the 1972 Liability Convention: An Issue of Interpretation

From the text of article I(a) of the Liability Convention, it is clear that cases of direct damage caused by contact with a space object that result in loss of life or impairment of health³ are covered. Any direct interference that destroys the normal use of property also appears to fall under this definition.⁴ It remains

[hereinafter Liability Convention]. To date 89 States are Parties to the Convention and 22 have signed it. See *Status of International Agreements relating to Activities in Outer Space*, U.N. OFFICE FOR OUTER SPACE AFFAIRS, <www.oosa.unvienna.org/oosa/en/SpaceLaw/treatystatus/index.html> (last visited Aug. 10, 2013).

2 Though they may be non-binding. Liability Convention, *supra* note 1, at art. XIX(2).

3 There is agreement that the expression “impairment of health” also includes mental damage. See, e.g., CARL CHRISTOL, *THE MODERN INTERNATIONAL LAW OF OUTER SPACE* 97-100 (1982); Frans von der Dunk, *The 1972 Liability Convention: Enhancing Adherence and Effective Application*, in 44 *PROC. COLLOQ. L. OUTER SPACE* 366, 369 (1998); see also Stephen Gorove, *Cosmos 954: Issues of Law and Policy*, 6 *J. SPACE L.*, 137, 140 (1978) (reading the phrase “loss of life, personal injury or other impairment of health” in light of the World Health Organization’s definition of health, which implies that the Liability Convention is broad enough to cover personal injury resulting in the impairment of mental faculties as well as including injuries affecting mental and social wellbeing) (internal citations omitted).

4 VALÉRIE KAYSER, *LAUNCHING SPACE OBJECTS: ISSUES OF LIABILITY AND FUTURE PROSPECTS* 47 (2001).

ambiguous, however, whether a number of general types of damage, including moral,⁵ nuclear,⁶ and indirect damages,⁷ are considered compensable.⁸ In addition to the uncertainty over the scope of damage, there is a lack of clarity in the Convention's definition of a "space object," which, pursuant to article I(d), "include[s] component parts of a space object as well as its launch vehicle and parts thereof."⁹ This leaves open the question of whether the Liability Convention regime is applicable to damage caused by space debris¹⁰ or damage caused by human activities in outer space, not component parts, such as direct broadcasting or back contamination of earth by extra-terrestrial materials.¹¹ Additional potential sources of liability that could not have been contemplated

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- 5 Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 7th Sess., 100th mtg., U.N. Doc. A/AC.105/C.2/SR.90-101, at 140-142 (June 18, 1968); W.F. Foster, *The Convention on International Liability for Damage Caused by Space Objects*, in 10 CANADIAN YEARBOOK OF INTERNATIONAL LAW, 137, 173 (1972) (asserting moral damage may be awarded).
 - 6 See, e.g., Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 8th Sess., 117th-118th mtgs., U.N. Doc. A/AC.105/C.2/SR.116-131, at 140-142 (June 17, 1969) (discussing the inclusion of nuclear damage).
 - 7 See, e.g., 1 MANUAL ON SPACE LAW 115 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1979) (explaining that at the seventh session of the Legal Subcommittee, the majority opinion on the issue of indirect damage was merely an issue of causality that was not necessary to state in the Convention); Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Responses to the set of Questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space, Note by the Secretariat, ¶ 2.2, U.N. Doc. A/AC.105/C.2/2013/CRP.18 (Apr. 8, 2013) (providing the Austrian delegation's interpretation of article I of the Convention, which includes indirect and consequential damage). See generally BIN CHENG, GENERAL PRINCIPLES OF LAW AS APPLIED BY INTERNATIONAL COURTS AND TRIBUNALS 241-53 (1953) (discussing the concept of proximate cause in international law).
 - 8 See, e.g., Foster, *supra* note 5, at 157; Carl Christol, *International Liability for Damage Caused by Space Objects*, 74 AM. J. INT'L L., 346 (1980); Joseph Burke, *Convention on International Liability for Damage Caused by Space Objects*, 8 FORDHAM INT'L L.J., 255, 256 (1984).
 - 9 Liability Convention, *supra* note 1, at art. I. See generally, Armel Kerrest, *Liability for Damage Caused by a Space Object*, in, SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATIONS 97-98 (Marietta Benkö & Kai-Uwe Schrogel eds., 2005) (expressing the view that article I of the Convention "does not define a space object, it only makes a precision to a definition to be found somewhere else," namely in the dictionary definition).
 - 10 Due to space limitations, the issue of liability for damage caused by space debris will not be specifically addressed in the present paper.
 - 11 See, e.g., Julian Verplaetse, *Comment on the Report of Professor Berezowski*, 8 PROC. COLLOQ. L. OUTER SPACE 140, 141-42 (1965) (raising the issue of potential liability for back contamination).

at the time of the drafting and do not fall squarely within the language of the treaty, but that in equity, should be protected, include man-made objects that are constructed completely in space from raw materials (and were therefore never launched), and damage caused by the intentional interference with outer space, the moon, or a celestial body that causes direct harm on earth. As an example of the former, the company Made in Space is trying to launch 3-D printers into orbit to create parts where they are needed.¹² The pieces were never “component parts of a space object,” nor were they “launch vehicle[s] and parts thereof,” yet if a space station support strut that was constructed entirely in outer space instead of being launched first from the surface were to tumble to earth and damage property, it would only be fair to compensate the victim for the harm suffered. An example of the latter can be found in the mission of Planetary Resources, an asteroid mining company that plans to capture an asteroid and tow it into earth’s orbit.¹³ Again, should the asteroid collide with a spacecraft in flight or hit the earth itself, it would seem only fair for the Liability Convention to apply, yet this source of damage does not appear to fit under the traditional definition of a “space object.”

An additional issue relevant to the scope of recovery under the Convention concerns on whose behalf a State may actually recover under the terms of the treaty. Pursuant to article III, only those people actually on board a (damaged) space object are eligible to recover for the harm suffered. Such a limitation apparently excludes compensation for astronauts (or, in the near future, space tourists) injured while engaging in extra-vehicular activities.¹⁴

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- 12 See, e.g., Siddharth Raval, *ESA Explores 3D Printing for Moon Base*, SPACE SAFETY MAGAZINE (Feb. 19, 2013), available at <www.spacesafetymagazine.com/2013/02/19/esa-explores-3d-printing-concept-construct-moon-base/> (discussing study by Foster+Partners for the European Space Agency to print a moon base out of lunar regolith). In an article discussing Article VIII of the Outer Space Treaty, Hamilton DeSaussure mentions the possibility of large structures fabricated in space “which, as an entity have never been on earth,” meaning the OST’s liability provisions will not apply. Hamilton DeSaussure, *Do We Need a Strict, Limited Liability Regime in Outer Space?*, 22 PROC. COLLOQ. L. OUTER SPACE 117, 118 (1979).
- 13 Mike Wall, *Asteroid Mining Venture Backed by Google Execs, James Cameron Unveiled*, SPACE.COM (Apr. 23, 2012), available at <www.space.com/15395-asteroid-mining-planetary-resources.html>.
- 14 Cf. DeSaussure, *supra* note 12, at 118 (noting that extra-vehicular activity that may not be associated with any launched object may not fit neatly into the liability scheme of the Outer Space Treaty). *But see*, Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 7th Sess., 93rd mtg., U.N. Doc. A/AC.105/C.2/SR.90-101, at 44 (June 7, 1968) (United States) (seemingly taking for granted that if the Convention were extended into outer space, “scientists exploring the surface of the moon [who] were disturbed or killed by the crash of a space object of another launching State - a possibility that was no less likely, at least for space-exploring States, than collisions between space objects” - these scientists would have to prove fault, but could recover under the Convention).

There is no unanimous view among academics about which types of harms caused by space objects are recoverable. For example, on the issue of indirect damages, Carl Christol has stated that the language "caused by" in the Convention should allow for "recovery of damages both for a direct hit and for the indirect or consequential aspects of an accident . . . resulting from the malfunctioning of a space object and its component parts."¹⁵ On the contrary, however, according to Stephen Gorove, the limitation "caused by" a space object could relate only to direct physical damage or impact. He notes that it could be "interpreted to mean that consequential damage where the damage does not flow directly and immediately from the act, but only from the consequences of such act, under normal circumstances would not be covered by the Convention."¹⁶

Understanding the exact meaning and scope of the Liability Convention's vague clause "damage caused by space objects," as well as its application to specific circumstances not clearly provided for in the text, requires an interpretation of the treaty. Consequently, we will look to the Vienna Convention on the Law of Treaties,¹⁷ which is generally regarded as the authoritative guide to the customary international law norms governing this type of analysis.¹⁸ Article 31 is the primary rule of interpretation, requiring consideration of the ordinary meaning of terms in light of their context, plus any subsequent agreement, practice, or relevant rules of international law, and where applicable, any special meaning agreed on by the Parties. Article 32 is a supplemental means of interpretation that may take into account the preparatory work of the treaty to confirm the meaning under article 31 or to provide further guidance when the primary methods leave the meaning ambiguous or absurd. In the following sections, we will apply each article to the Liability Convention in order to better explore the scope and meaning of the concept of "damage caused by space objects."

15 Christol, *supra* note 8, at 362. See also Lalin Kovudhikulrungsri & Duangden Nakseeharach, *Liability Regime of International Space Law: Some Lessons from International Nuclear Law*, 4 J. E. ASIA & INT'L L. 291, 306 (2011).

16 See Gorove, *supra* note 3, at 141; I.H. PH. DIEDERIKS-VERSHOOR, AN INTRODUCTION TO SPACE LAW 41 (1999).

17 Vienna Convention on the Law of Treaties, May 23 1969, 1155 U.N.T.S. 331, 8 I.L.M. 679 [hereinafter VCLT].

18 See Evan Criddle, *The Vienna Convention on the Law of Treaties in U.S. Treaty Interpretation*, 44 VA. J. INT'L L. 431, 433 (2004). See e.g., Arbitral Award of 31 July 1989 (Guinea-Bissau v. Sen.), Judgment, 1991 I.C.J. 53, ¶ 48 (Nov. 12) (recognizing articles 31 and 32 of the VCLT as codifications of customary international law); Kasikili/Sedudu Island (Bots. v. Namib.), Judgment, 1999 I.C.J. 1045, ¶ 18 (Dec. 13) (same as to article 31).

III. Exploring the Textual Meaning of the Notion of Damage

The primary rule articulated in article 31.1 of the VCLT states that “[a] treaty shall be interpreted in good faith in accordance with the ordinary meaning given to the terms of the treaty in their context and in the light of its object and purpose.” As discussed above, however, the wording of articles I and II of the Liability Convention is anything but clear and there is no consensus as to what damages are compensable.

Looking only at the ordinary meaning, there is a plausible argument that the word damage should be viewed restrictively.¹⁹ Under such a reading, compensation would be limited to those damages that are directly caused by a space object and that consist of physical or mental harm or damage to property,²⁰ excluding, for instance, indirect damages and damages to “humanity” (which cannot be regarded as a natural or juridical person under article I).

Additional support for a restrictive interpretation relies on one of the other criteria listed in article 31.4 of the VCLT, which states: “a special meaning shall be given to a term if it is established that the parties so intended.” Because the Parties decided not to specifically include certain types of harms or space technologies in the definitions of “damage” or “space object,” the definition they agreed on could be interpreted as excluding them. Since the drafters could envision and even discussed these specific forms of damage that could be sustained, the fact these were not incorporated into the final treaty could be viewed as a deliberate choice.

One problem with this interpretation, however, is that the drafters knew they were not prescient and would not be able to include every possible type of damage that might ever exist.²¹ Although they surely recognized that technology would improve and that there would be new space actors, during the ten-year period through which this Convention was hammered out, many of the specific developments we have today were merely figments of imagination brought to life by such late-1960s classics as *Star Trek* and *2001: A Space Odyssey*.

19 *But see*, William H. Schwarzschild III, *Space Law – Convention on Liability – Procedure Established to Enforce Liability for Damage Caused by Space Objects*, 6 VAND. J. TRANSNAT’L L. 262, 268-69 (1972) (“[T]he Convention invites a broad interpretation of ‘damage’ through its failure to offer an adequate definition of the term, but the scope of this definition can be circumscribed by narrow application of the principle of causation in a particular case”).

20 *See, e.g.*, 46 C.J.S. INSURANCE § 1366 (defining property damage as “physical injury to or destruction of tangible property or loss of use of tangible property which has not been physically injured or destroyed”).

21 On this point, see *Treaty on Outer Space: Hearing Before the S. Comm. on Foreign Relations*, 90th Cong. 75 (1967) (statement of Arthur Goldberg, Ambassador to the United Nations) (discussing the uncertainty of future forms of damage). *Cf.* Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 7th Sess., 93d mtg., U.N. Doc. A/AC.105/C.2/SR.90-101, at 42 (June 7, 1968) (France) (raising the possibility of forms of damage that have not yet been discovered).

Furthermore, such a restrictive view collides with the fact that the primary goal of this treaty was to protect the citizens of non-spacefaring nations from the activities of those undertaking an inherently dangerous activity. Because the Convention must be viewed as a victim-oriented treaty, a non-literal interpretation of damage seems to be the most reasonable in light of its "object and purpose."

Further analysis of the "context" of the treaty requires examining the preamble. This portion of the document provides some of the background and impetus for the Convention, in which the States Parties "[r]ecogniz[e] the need to . . . ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage." As the Treaty was conceived in order to grant maximum protection to potential innocent victims harmed because of another State Party's use of outer space, it is reasonable to interpret "damage caused by space objects" as broadly as possible so that it includes any possible damage, caused directly or indirectly. The operative articles of a treaty can also help explain the context. Thus, additional support for the broad interpretation of damage caused by a space object comes from a combined reading of articles I and XXI of the Liability Convention. Article XXI establishes aid by a third party State to a launching State when "the damage caused by a space object presents a large-scale danger to human life or seriously interferes with the living conditions of the population or the functioning of vital centres."²² Within this framework, "damage" in article I could encompass any form of significant environmental damage, including back contamination by extra-terrestrial material and nuclear damages. Even if the harm were to a global commons, if the damage were widespread and especially if it affected living conditions, it could be considered recoverable.

As we have shown, using the interpretive methods of articles 31.1 and 31.4 of the VCLT provide credible arguments for an extremely narrow or a very wide reading of "damage" under the Liability Convention. For this reason, we must consider the other criteria of treaty interpretation.

IV. The Scope of Damage in States' Subsequent Practice

According to article 31.3 of the VCLT, when interpreting a treaty, "[t]here shall be taken into account, together with the context: (a) any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions; (b) any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding interpretation."

Cases of actual damage caused by a space object are fortunately very scarce. Nevertheless, the debate following one well-known incident, the crash of the Soviet satellite Cosmos 954 in Canada in 1978, provides some indications of subsequent State practice. Specifically, in the aftermath of the event, there were questions of whether Cosmos 954 caused "damage" as it is defined in article

22 Liability Convention, *supra* note 1, at art. XXI.

I of the Liability Convention (to which both nations were Parties).²³ Cosmos came down in what were then the Canadian provinces of the Northwest Territories, Alberta, and Saskatchewan.²⁴ Because the Cosmos RORSAT series of satellites were nuclear powered, the debris from the reactor was radioactive. As a result of the crash, there was no loss of life, physical injury, or direct damage to property, yet Canada took precautionary measures to avoid a public health hazard due to the satellite's radioactive emissions.

Canada tried to recover the costs it bore for locating, removing and storing the satellite debris by presenting a claim, through diplomatic channels, to the Soviet Union. In its statement of claim Canada argued: "The deposit of hazardous radioactive debris from the satellite throughout a large area of Canadian territory, and the presence of that debris in the environment rendering part of Canada's territory unfit for use, constituted 'damage to property' within the meaning of the [Liability] Convention."²⁵

To date, the clean-up request due to the Cosmos incident is the only claim that has ever been made under the Convention.²⁶ It was never adjudicated, as the two nations settled.²⁷ Because of the agreement, however, this claim demonstrates that, at least between these two parties, consequential damages associated with harmful radiation from debris could fall within the scope of "damage caused by space objects" under the Convention.²⁸ As one commentator has pointed out, although the agreement was silent as to the basis for the final payment, the Settlement refers to compensation for "all those matters . . . including the claim advanced by Canada."²⁹ Thus, the "conclusion that the settlement

23 The Soviet Union ratified in 1973 and Canada acceded in 1975. *Treaty Signatures*, U.N. OFFICE FOR OUTER SPACE AFFAIRS, <www.oosa.unvienna.org/oosatdb/showTreatySignatures.do> (last visited Aug. 19, 2013).

24 Settlement of Claim between Canada and the Union of Soviet Socialist Republics for Damage Caused by "Cosmos 954" (released on Apr. 2, 1981), Settlement, ¶ 2 [hereinafter *Cosmos Settlement*].

25 *Id.*, at ¶ 25(a).

26 *But see*, Andrei Terekhov, *International Liability for Damage Caused by Space Objects with Nuclear Power Sources on Board*, in 35 PROC. COLLOQ. L. OUTER SPACE 151, 155-56 (1992) (arguing that, while damage caused to "elements of the environment which are the property of a natural or juridical person" should be compensable under the Convention, the Cosmos incident was not *actually* settled under it and thus it may not be considered precedent).

27 *Cosmos Settlement*, *supra* note 24, at art. I.

28 *See* Doo Hwan Kim, *Liability for Compensation for Damage Caused by Space Debris*, in THE USE OF AIR AND OUTER SPACE COOPERATION AND COMPETITION 305, 314 (Chia-Jui Cheng ed., 1998); *see also* Terekhov, *supra* note 26, at 154 (concluding that it was not brought under the Convention, but summarizing the views of many scholars who believe the Convention applies to the Cosmos incident).

29 *Cosmos Settlement*, *supra* note 24, at art. II.

was agreed on the basis of all legal instruments proposed by Canada" (which included the Liability Convention) is a plausible one.³⁰

The recognition that nuclear damages caused by space objects could be a real issue was also one of the driving forces behind the drafting of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space,³¹ which was finally adopted in 1992 and may help fill a potential legal void. Indeed, while there was fairly unanimous support for the inclusion of nuclear damages by Western Bloc countries during the drafting of the Convention³² and the Soviet Union eventually expressed its willingness to compromise on this issue in 1969,³³ explicit inclusion of nuclear damages does not appear in the text.

For the first time, then, the NPS Declaration expressly extended the Liability Convention's scope to include those damages caused by the use of nuclear power sources in outer space and clearly stated – probably taking into consideration the experience of the Cosmos accident – that "search, recovery and clean-up operations, including expenses for assistance received from third parties" were to be included.³⁴ Although the Principles are a non-binding instrument, the fact that they were adopted within the United Nations General Assembly permits us to consider them as a subsequent agreement among the Parties when interpreting the Liability Convention (to which the Principles expressly refer), per article 31.3(a) of the VCLT.

In light of the settlement of the Cosmos incident and by the terms of the NPS Declaration, indirect and intangible damages have been construed somewhat broadly. Furthermore, a reading that includes indirect damage seems to be in line with the deliberations in the United States prior to the re-entry of the Skylab space station in 1979. Questions of liability for damage caused by Skylab were discussed in Senate hearings with Neil Hosenball, the General Counsel of NASA. A Senator asked if a "Skylab piece hits [a] car; the car then swerves and bangs me up. Would not Skylab be the proximate cause of my injury?" Mr. Hosenball replied: "If it was the proximate cause of Skylab, yes; I would pay."³⁵

30 PHILIPPE SANDS, *PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW* 898 (2d ed. 2003).

31 Principles Relevant to the Use of Nuclear Power Sources in Outer Space, G.A. Res. 47/68, U.N. Doc. A/RES/47/68 (Feb. 23, 1993) [hereinafter NPS Declaration].

32 See *MANUAL ON SPACE LAW*, *supra* note 7, at 115.

33 Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 8th Sess., 118th mtg., U.N. Doc. A/AC.105/C.2/SR.116-131, at 82 (June 17, 1969) (Soviet Union) ("[USSR] was prepared to agree to the extension of the convention to cover nuclear damage").

34 NPS Declaration, *supra* note 31, at 9.1 and 9.3.

35 *NASA Skylab Reentry: Hearing Before the Subcomm. of the H. Comm. on Gov't Operations*, 96th Cong. 90-91 (1979) (Statement of Neil Hosenball, General Counsel, NASA) [hereinafter *Skylab Senate Hearings*]. *But cf.* STAFF OF S. COMM. ON AERONAUTICAL AND SPACE SCIENCES, 92D CONG., *CONVENTION ON INTERNATIONAL LIABILITY FOR DAMAGE CAUSED BY SPACE OBJECTS ANALYSIS AND BACKGROUND DATA* 24 (1972) [hereinafter *SENATE REPORT ON LIABILITY CONVENTION*], *quoting*

This supports the view that indirect damage that meets the Anglo-American tort law standard of reasonable foreseeability would be covered.³⁶

In spite of the strict literal wording of articles I and II of the Convention discussed in the preceding section, an expansive reading of the above view could be used to support a broader conception of recoverable indirect damages. These may include harm caused by direct broadcasting or satellite transmissions, such as the unpopular or unseemly content of a transmitted program.³⁷ There are also significant privacy harms that could result from the myriad microsatellites that private companies are putting into orbit for the purpose of earth observation and imaging.³⁸ In light of specific State practice with regard

the United States delegate to the COPUOS Legal Subcommittee on June 30, 1971, expressing the United States' position that the Convention: "holds a launching State liable for damage traceable directly to the launching, flight and re-entry of a space object or associated launch vehicle but does not cover what some delegations earlier called remote or indirect damage and for which there is only a hypothetical causal connection with a particular space activity." The discussion in the United States Senate which preceded the re-entry of Cosmos is interesting also because it appears that the United States' understanding of damage includes moral damages. On the question of whether the United States would compensate for pain and suffering caused by the re-entry of Skylab, Mr. Schaffer, from the United States Justice Department, replied that it would be covered. *Skylab Senate Hearings*, at 154.

36 Cf. *Palsgraf v. Long Island R. Co.*, 162 N.E. 99 (N.Y. 1928). See also Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Japan: Working Paper, U.N. Doc. A/AC.105/C.2/L.61 and Corr. 1, reprinted in Legal Subcomm., Rep. on its 8th Sess., annex II, at 31, U.N.Doc. A/AC.105/58 (July 4, 1969) (expressing the view that the Convention should not use the words "indirect damage" and "delayed damage," but instead should resort to the principle of proximate causation, that is there must be an adequate relationship between the cause and effect for the damage to be covered).

37 *But see*, David I. Fisher, *Injury to Rights of Personality Caused by Satellite Program Contents*, 39 SCANDINAVIAN STUD. L. 419, 425 (2000) (relying largely on a textual approach to conclude that "the scope of the Liability Convention appears limited to cases involving damage caused by space objects themselves, whereas other damage incidental to the use of such objects appears to fall outside its scope. Thus, a television satellite crashing to the surface of the earth would be a likely candidate for application of the Liability Convention, whereas damage to reputational interests caused by a broadcast from the same satellite would not.")

38 See Anne Eisenberg, *Microsatellites: What Big Eyes They Have*, N.Y. TIMES, Aug. 10, 2013, <www.nytimes.com/2013/08/11/business/microsatellites-what-big-eyes-they-have.html> (raising some of the privacy concerns that come out of Silicon Valley startups like Skybox and Planet Labs that have raised millions of dollars to launch small imaging satellites). *But see*, Stephen Gorove, *Some Thoughts on Liability for the Use of Data Acquired by Earth Resources Satellites*, 15 PROC. COLLOQ. L. OUTER SPACE 109, 109 (1972) (arguing that imaging data is not damage caused "by" the space object itself, rather it "result[s] from the intentional or negligent act of a party involving the use or dissemination of data").

to liability for the signal malfunction of Global Navigation Satellite Systems (GNSS), there is a colorable argument that these forms of indirect harm due to satellite broadcasting may be compensable under the Convention.³⁹ As an example, the INTELSAT Operating Agreement expressly provided for a waiver of liability between signatory States and the Organization "for loss or damage sustained by reason of any unavailability, delay or faultiness of telecommunications services."⁴⁰ It has been argued that the inclusion of this express waiver of liability can be read as the States' understanding that the malfunctioning of telecommunications services does, in fact, constitute a recoverable damage under the Liability Convention.⁴¹

Another indicator of what damages should be considered recoverable is national space legislation enacted by different States in the years since the Liability Convention was adopted. By regulating liability for private actors through licensing for launches and other space activities, several national space laws point towards a broad reading of the "damage caused by space objects." As an example, the definition of damage in the Brazilian Authorization Regulation, although almost identical to the one contained in article I of the Liability Convention, also includes environmental damage.⁴²

Similarly, article 10 of the Dutch *Rules Concerning Space Activities* states that if an incident occurs "that may jeopardize the safety of persons and goods, environmental protection in outer space, the maintenance of public order or national security, or otherwise cause damage, the licence-holder shall" take steps

39 Cf. V.S. Vereshchetin & V.M. Postyshev, Responsibility of States for Remote Sensing Activities, 28 PROC. COLLOQ. L. OUTER SPACE 247, 249 (1985) (recognizing the difficulty of determining liability for the use of remote sensing data, which may "negatively affect the economy of states, especially the economies of the developing countries"). *But see*, UNIDROIT Secretariat, An Instrument on Third Party Liability for Global Navigation Satellite System (GNSS) Services: A Preliminary Study, at 21 (Mar. 2010), available at <www.unidroit.org/english/documents/2010/study79/s-79-preliminarystudy-e.pdf> (stating that indirect damage caused by malfunctioning GNSS systems is not covered under the Liability Convention regime, but only applies in cases of physical collision).

40 Operating Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT," 10 I.L.M. 946, at art. 18(a) (1971).

41 See P. Rodríguez-Contreras Pérez, *Damage Caused by GNSS Signals in the Light of the Liability Convention of 1972*, in *SATELLITE NAVIGATION SYSTEMS* 252 (M. Rycroft ed., 2003).

42 Regulation on Procedures for the Authorization of Space Launching [sic] Operation on Brazilian Territory, art. 4, ¶ 2 (Feb. 21, 2002), available at <www.sbda.org.br/textos/DirEsp/Portaria_5_AEB_%202002_E.pdf> (defining damage as "loss of human life, personal injuries or other health impairments, loss of State property or of natural or legal person's property, including intergovernmental organizations, as well as damage inflicted to the environment"). See generally José Monserrat Filho, *Regulation of Space Activities in Brazil*, in *NATIONAL REGULATION OF SPACE ACTIVITIES* 61, 76 (Ram S. Jakhu ed., 2010).

to limit or mitigate the damage to the extent possible.⁴³ Although referring to the obligations of the “licence-holder,” this article clearly provides a broad conception of damage encompassing that which affects humanity as a whole (space environmental damage) and the intangible and unquantifiable harms to such realms as public order or national security.

The Swedish *Act on Space Activities* expressly establishes a regime for indemnification of the government by those who carry out space activities. The damage to which the Act refers includes “damage which has come about as a result of space activities.”⁴⁴ Through this expansive statement, the Swedish Act seems to include both indirect damages and damages derived generally from space activities, rather than merely direct physical damage caused by a collision with or crash of a space object.

More generally, the Liability Convention speaks of “damage *caused by space objects*” (emphasis added). Thus, if “space object” is given a generous reading, the concept of the damage caused as a whole could be interpreted to have greater scope. Unfortunately, there was no generally accepted legal definition of “space object” at the time the Convention was concluded.⁴⁵ Even today, while definitions of “space object” vary in national legislation, most States seem to take a broad view of what is covered. For example, the Australian *Space Activities Act 1998* ties its definition to launch vehicles, payloads, and any components thereof that are intended to go above 100 kilometers.⁴⁶ The Austrian space act defines “space object” even more generally, as any object launched or intended to be launched into outer space, including its components.⁴⁷

All in all, from the foregoing brief analysis of State practice, it seems that States have shown a tendency to broadly interpret the notion of “damage caused by space objects.” However, there have been few to no disputes through which to test the limits of these terms and the associated State interpretations. Without consistent practical application of these liability issues, many questions remain as to which specific damages are recoverable under the Liability Convention.

43 *Rules Concerning Space Activities and the Establishment of a Registry of Space Objects*, sect. 10.1 (June 6, 2013) (Neth.), available at <www.unoosa.org/oosa/en/SpaceLaw/national/netherlands/space_activities_actE.html>.

44 *Act on Space Activities* (1982:963), sect. 6 (Swed.), available at <www.unoosa.org/oosa/en/SpaceLaw/national/sweden/act_on_space_activities_1982E.html>.

45 At the time, the United States, for example, established that “[t]here does not seem to be any generally accepted legal definition,” and determined what it did not cover (“objects that are not intended to go into orbit or beyond”) rather than what it did cover. SENATE REPORT ON LIABILITY CONVENTION, *supra* note 35, at 25.

46 *Space Activities Act 1998* (Cth) pt 2, para 8 (Austl.).

47 *Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry*, art. 2. (Austria), available at, <www.unoosa.org/pdf/spacelaw/national/austria/austrian-outer-space-actE.pdf>.

V. Application of Relevant Rules of International Law and Evolutive Treaty Interpretation to the Scope of Damage

Another means of treaty interpretation under the VCLT takes into account "any relevant rules of international law applicable in the relations between the parties."⁴⁸ This standard, also known as evolutive treaty interpretation, is based on the assumption that treaty provisions are evolving and thus adapt to emerging norms of international law.⁴⁹ In *Dispute Regarding Navigational and Related Rights*, the International Court of Justice recognized that while a treaty's terms generally "must be interpreted in light of what is determined to have been the parties' common intention" at the time of the treaty's conclusion, there are situations in which it may be presumed that the parties' intent was to give the terms "a meaning or content capable of evolving, not one fixed once and for all, so as to make allowance for, among other things, developments in international law."⁵⁰ Applying this evolutive interpretation to the notion of "damage caused by space objects" under the Liability Convention, we can conclude that the drafters, by adopting a vague and open-ended definition, intended for the term to evolve as technology changed and new forms of damage and unimagined space objects were created. Article XII of the Liability Convention seems to support this view by holding the compensation for which a launching State is liable to be "determined in accordance with international law and principles of equity and justice." Although the provision is not talking specifically about the type of damage, it nevertheless ties liability to general international law and thus to any emerging norm of international law relevant to establishing compensable damages. In light of the fact that we may examine changing understandings of relevant legal concepts when interpreting the Liability Convention, it is important to consider, for instance, the significant developments in the international rules concerning the protection of the environment and other global commons that have arisen in the period since the Convention was drafted. We must look specifically at the newfound awareness that a State's hazardous activities can cause harm worldwide to see if this might represent an evolution in the conception

48 VCLT, *supra* note 17, at art. 31.3(c). General principles of international law, including those norms related to the notions of damage and compensation, are relevant even considering that international space law is generally regarded as *lex specialis*. This means that general international norms are applicable to outer space activities, unless they conflict with the specific rules of the *corpus juris spatialis*.

49 E.g., *Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slov.)*, 1997 I.C.J. 7, 65, 67 (Sept. 25) (recognizing that the fact that the treaty at issue in that case was "designed to accommodate change, made it possible for the parties to take account of such developments and to apply them when implementing those treaty provisions"). See generally Sondre Torp Helmersen, *Evolutive Treaty Interpretation: Legality, Semantics and Distinctions*, 6 EUR. J. LEGAL STUD. 127, 131-34 (2013) (discussing other cases in which the I.C.J. has recognized evolutive interpretation).

50 *Dispute Regarding Navigational and Related Rights (Costa Rica v. Nicar.)* 2009 I.C.J. 213, 242 (July 13).

of damages recoverable under the Convention. For example, the 2006 International Law Commission's Principles on the Allocation of Loss in the Case of Transboundary Harm Arising Out of Hazardous Activities require States to compensate "victims of transboundary damage caused by hazardous activities located within its territory or otherwise under its jurisdiction or control," and considers loss of or harm done to the environment or to cultural heritage in its definition of damage.⁵¹ Though this document has no formal legal force, it can be seen as reflecting customary law.

Furthermore, a United Nations Environment Programme Working Group set up to consider unresolved issues under the United Nations Compensation Commission for damage caused by Iraq during its invasion of Kuwait determined "that a state may also be able to claim for damage to its environment as a result of damage to areas beyond national jurisdiction."⁵² Thus, a State that could demonstrate it was harmed indirectly by damage to a territory outside national jurisdiction (like the high seas or outer space) could recover. This conclusion represents the progressive recognition that in cases of damage to areas considered global commons, "all states should have the *locus standi* to seek compensation against the violating State under the doctrine of obligations *erga omnes*," provided, of course, they can show some particularized damage.⁵³ Taking all of these developments into account, it is thus no surprise that the International Law Association Draft International Instrument on the Protection of the Environment from Damage Caused by Space Debris, although never adopted and thus non-binding, embraced a definition of damage that includes "any adverse modification of the environment of areas within or beyond national jurisdiction or control."⁵⁴ Additionally, the scope of the instrument makes it applicable to any debris "likely to cause direct or indirect, instant or delayed damage to the environment."⁵⁵ Such an inclusion may be read in one of two ways. It could imply that the Liability Convention does not cover such

51 G.A. Res. 61/36, at principles 2, 4, U.N. Doc, A/RES/61/36 (2006).

52 Ruth Mackenzie & Ruth Khalastchi, *Liability and Compensation for Environmental Damage in the Context of the Work of the United Nations Compensation Commission*, 5 REVIEW OF EUROPEAN COMMUNITY & INTERNATIONAL ENVIRONMENTAL LAW 281, 287 (1996) (emphasis in original).

53 TARCÍSIO HARDMAN REIS, COMPENSATION FOR ENVIRONMENTAL DAMAGES UNDER INTERNATIONAL LAW: THE ROLE OF THE INTERNATIONAL JUDGE 174 (2011). Cf. Paul Dembling, *Cosmos 954 and the Space Treaties*, 6 J. SPACE L. 129, 135 (1978) (raising the possibility of compensation for depletion of the ozone layer under the Liability Convention).

54 International Law Association Draft International Instrument on the Protection of the Environment from Damage Caused by Space Debris, art. 1 (1994), *reprinted in* Karl-Heinz Böckstiegel, *ILA Draft Convention on Space Debris*, 44 Z.L.W. 29 (1995).

55 *Id.* at art. 2.

forms of damage and thus it needs to be specified here, or it could be viewed as an evolution in the understanding and scope of the word damage.⁵⁶ From another perspective, the reference to international law in article XII of the Liability Convention seems to express its adherence to the general legal principle of *restitutio in integrum*, which restores a victim to the condition that would have existed had the damage not occurred. This concept encompasses both *damnum emergens*, the direct loss suffered, and *lucrum cessans*, lost profits.⁵⁷ According to the practice of international tribunals, this latter form of damage, profit which would have been possible in the ordinary course of events, is recoverable unless it "come[s] under the heading of possible but contingent and indeterminate damage."⁵⁸ Under this view, for damage to be recoverable, it must flow directly and consequently from the event causing the harm. This is distinguished from indirect damage, which involves a break in the causal chain between the event and the harm and which is traditionally excluded from compensation under international law.⁵⁹ Therefore, in contrast with emerging State practice concerning damages caused by space objects, when looking at general international law, the conclusion weighs more heavily toward excluding indirect damages from the scope of the Liability Convention. In short, even when interpreting the Convention using the evolutive method, doubts remain as to which damages caused by space objects should be covered. While the inclusion of direct environmental damage to global commons (including outer space) seems to be supported by evolving trends in international law, this interpretative method does not help with regard to the inclusion of other specific types of damages (for example, those caused by direct broadcasting, harm to the environment not caused by space objects as such, or injury to astronauts or tourists who are not physically on a space object). It probably also excludes indirect damages, in contrast with the conclusions that can be drawn by applying other interpretative methods.

56 On a similar point, see Tanja Zwaan & Walter de Vries, *Liability Aspects of the International Space Station Agreement of 29 September 1988* 32 PROC. COLLOQ. L. OUTER SPACE 445, 447 (1989) (noting that the Space Station Agreement explicitly extends the protections of the Liability Convention to include lost profits and indirect or consequential damage, thereby implying that they are not protected absent this agreement).

57 Armel Kerrest & Lesley Jane Smith, *Article VII, in COLOGNE COMMENTARY ON SPACE LAW*, VOL. 1, 126, 141 (Stephen Hobe, Bernhard Schmidt-Tedd & K. Shrogl eds., 2009). Cf. Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Hungary: Proposed Draft Agreement Concerning Liability for Damage Caused by the Launching of Objects into Outer Space, art. II, U.N. Doc. A/AC.105/C.2/L.10 (Mar. 16, 1964) (providing lost profits and moral damages if the law of the liable state allows it).

58 *Factory at Chorzów (Ger. v. Pol.)*, Indemnity, 1928 P.C.I.J. (ser. A) No. 17, at 57 (Sept. 13).

59 See KAYSER, *supra* note 4, at 49.

VI. The Drafters' Debate over the Breadth and Extent of the Concept of Damage

Because the above analysis does not provide definitive answers, we finally turn briefly to a discussion of the *travaux préparatoires* of the Liability Convention. This means of interpretation, though only considered complementary, may help clarify the scope of the provisions of the Liability Convention. Some of this has been discussed where relevant above and other scholars have undertaken detailed analyses of the drafting history of the Convention.⁶⁰ Therefore, it suffices here to reiterate that the delegates had widely differing views on a variety of damage-related issues.

The main sticking points in the scope of the definition were whether indirect, moral, or nuclear damages would be covered.⁶¹ By the end of the sixth session of the Legal Subcommittee, the delegates agreed on a provisional definition for damage that was nearly identical to the one finally adopted in the Convention, but could not agree on whether it should include indirect or delayed damage.⁶² This question was dropped in the seventh session and left as an issue of proximate causation. With regard to nuclear damage, a revised draft text submitted by Hungary in 1965 explicitly eliminated liability for nuclear damage.⁶³ By 1969, the Soviet Union, which had favored the Hungarian draft, changed its position and indicated that it was willing to consider the inclusion of nuclear damages.⁶⁴ Many other issues related to damage remained, but as Jasentuliyana explains, the records for the next couple of years before adoption of the Convention are sparse.⁶⁵

In short, as the agreed-upon definition of damage under the Convention is rather vague and States had vastly differing viewpoints on the extent of coverage, the *travaux* does not shed as much light on the interpretation as one would hope.

60 For a thorough summary of the drafting history and some of the major disagreements between States, see MANUAL ON SPACE LAW, *supra* note 7, at 87-98, 115-17; N.M. MATTE, AEROSPACE LAW 337-48 (1969) (discussing the early drafting history); OGUNSOOLA OGUNBANWO, INTERNATIONAL LAW AND OUTER SPACE ACTIVITIES 147-80 (1975).

61 See *supra* notes 76-79; see also, STAFF OF S. COMM. ON AERONAUTICAL AND SPACE SCIENCES, 92D CONG., SOVIET SPACE PROGRAMS 1966-70, 480-83 (1971).

62 Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Rep. on its 6th Sess., at ¶ 17, U.N. Doc. A/AC.105/37 (July 14, 1967) (note: the only changes to the final draft are the use of the words “loss of” before “or damage to property” and the insertion of “intergovernmental” between “international” and “organizations”).

63 Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Hungary: revised draft Convention concerning Liability for Damage caused by the Launching of Objects [sic] into Outer Space, U.N. Doc. A/AC.105/C.2/L.10/Rev.1, art. I(1) (b) (Sept. 24, 1965). See also Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 7th Sess., 91st mtg., U.N. Doc. A/AC.105/C.2/SR.90-101, at 8 (June 5, 1968) (Hungary) (maintaining its position).

64 See text accompanying *supra* note 33.

65 MANUAL ON SPACE LAW, *supra* note 7, at 89-90.

VII. Conclusion

After applying the various interpretive methods demanded by the VCLT, we find that different approaches yield different conclusions. As much as drafters hope for clarity in the laws they write, this Convention does not definitively provide an answer to the question of exactly what damages are recoverable. This was recognized by the negotiators at the time of drafting, but in order to conclude the Convention in a timely manner, they agreed that it was, perhaps, better to wait and create an additional treaty or protocol on damage sustained from space activities at some future time when human presence in space was more frequent.⁶⁶

While we clearly do not yet have large permanent colonies on the moon, space is certainly more populated today than ever before by humans on the International Space Station, satellites in many types of orbits, and uncountable pieces of space debris. Additionally, the ideas and activities of private space entrepreneurs are exciting, but they push at the edges of our conception of traditional liability in outer space. Microsatellites, 3-D printing, asteroid capture, and protection of cultural sites with the advent of tourism, raise questions of legal responsibility that are prospective today but will soon be real. Although the current uncertainty has apparently not frozen exploration and commercial activity in space, the lack of clarity can nonetheless have a chilling effect on development. Therefore, the time has come to start thinking about amending the Liability Convention, taking into account the last forty years' developments in law and technology. The Convention itself envisions periodic review at the behest of States (article XXVI), the ability of any State Party to propose amendments (article XXV), and the ability of States to supplement or extend the current treaty (article XXIII). We hope that States Parties will use one of the tools provided by the drafters to strengthen and update the Liability Convention so that it takes a clear stance on what is encompassed by the concept of "damage caused by space objects." We believe it would be proper to positively include such forms as moral, indirect and nuclear damages, as well as environmental damages and damages caused by direct broadcasting and GNSS. We do not expect such an expansive definition to hinder growth of outer space activities. Rather, by carefully considering what should be included in order to protect innocent victims, we hope such an amendment would state explicitly and openly what is today subject to uncertainty and question. If the regulations are known and understood, outer space actors can better account for them and take the necessary precautions to promote safety and security on Earth and in orbit so that outer space may truly be used "for the benefit and in the interests of all countries."⁶⁷

66 Herbert Reis, *Some Reflections on the Liability for Outer Space*, 6 J. SPACE L. 125, 127 (1978).

67 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, art. I, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205.