

Closing the Liability Loophole: The Liability Convention and the Future of Conflict in Space

Trevor Kehrer*

Abstract

The 21st century has borne witness to an explosion of human activity of all kinds in space; but the rules that govern that activity have failed to keep pace. The extant international liability regime for damage on Earth caused by space objects has a blind spot that the original framers could not have anticipated: an object launched into space by one nation may now come under the control of another nation—or even a private actor—through cyberwarfare. Moreover, the liability regime has another problem: if an incident involving an object in space results in harm on Earth, the Liability Convention does not demand an inquiry into—or consider—the underlying cause of the incident. If such an event were to come to pass, under the current regime of international law regarding space, the state that launched the space object would assume an obligation to pay for any harm on Earth caused by that object. The consequence of this order is a paradox; one in which a state’s responsibility to pay for damage is not linked to proximate causation or its own actions, but instead to mere ownership or assistance in launching the object. Thus, wholly innocent launching states will currently foot the bill for any damage caused by unknown culprits or third parties. This is in contravention of basic principles of state responsibility and is at odds with the result anticipated by the analogous customary law of the sea. As space becomes more crowded with potentially vulnerable space objects and future conflict in space becomes more likely, this misattribution of responsibility must be corrected in order to ensure that the Liability Convention’s stated goal of creating “effective international rules and procedures concerning liability” actually strengthens international cooperation instead of undermining it.

* J.D. Candidate, 2020, The University of Chicago Law School. I would like to express my sincerest gratitude to Professor Eric Posner for his guidance and to Marcus Bauer, Whitney Barth, and the rest of the CJIL team for their patience and encouragement. I would also like to thank Professor Alison Dundes Renteln for her mentorship and for inspiring my interest in international law, my friends for their camaraderie, and my family for its boundless love and support.

Table of Contents

I. Introduction.....	180
II. Background of the Present Liability Regime.....	182
III. Setting Sail for Disaster: Practical and Conceptual Problems for the Liability Convention.....	186
A. The Issue of Intervening Actors: Practical Problems for the Liability Convention	187
1. The bar to entry to space has been lowered, and commercialization of space is now high-universal.....	189
2. Militarization of space has kept pace with commercialization.	190
3. Cyberwarfare capabilities are expanding and are being increasingly oriented towards space.	191
B. A Matter of Principle: Conceptual Problems for the Liability Convention	194
IV. Understanding the Liability Loophole in Practice	197
A. A Fully-Armed and Operational Space Station: Stress-testing the Liability Convention's Mechanics	197
1. The International Space Station's legal framework cannot repel a problem of this magnitude.....	198
2. The Liability Convention does not have it where it counts.....	199
3. The return of market share liability?	200
4. Article VII of the Liability Convention is a phantom menace.....	202
5. Do, or do not; there is no try.	202
V. Proposed Solutions for Closing the Loophole	203
A. Interpret the Liability Convention to Conform to Background Principles of State Responsibility	204
B. Interpret the Liability Convention to Excuse Launching States from Responsibility When Another State Intended to Cause Harm	205
C. Amend the Liability Convention to Create a Hybrid Regime.....	207
D. Potential Objections and Responses	208
1. Strict liability is appropriate because it encourages precaution, reduces dangerous activity levels, and reduces administrative costs.	209
2. Reinterpreting the Liability Convention is arbitrary and leaves victims of harm without compensation.	211
3. The hybrid regime cannot work because amendment is too difficult... ..	212
4. The hybrid regime cannot work because its administrative costs are too high.	213
5. The Liability Convention itself and all of the proposed solutions are impractical.	214
VI. Conclusion.....	215

I. INTRODUCTION

As commercialization and militarization of space proceed at an exponential rate, more actors than ever before are reaching for the stars. Indeed, astronauts and the satellites they live on and service are becoming increasingly critical to a globalized economy.¹ Distressingly, however, the current liability regime creates a loophole of just the right size to permit a bad actor to bring a space object back down to Earth and cause harm, yet never worry about facing liability for that harm. This is because current international law commands that a state assume responsibility for harm caused by a satellite it launched regardless of whether there was an intervening actor. Opportunities for mischief abound as a result, and this paper will explore hypotheticals that sketch out the shape that future conflict in space may consequently take.

The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (the “Outer Space Treaty”) laid the groundwork for a system of “international liability for damage” caused by objects in space, but did not create a comprehensive regime.² That task was instead left to the 1972 Convention on International Liability for Damage Caused by Space Objects (the “Liability Convention”). By the terms of the Liability Convention, when harm on Earth is caused by an object in space or formerly in space, the state that launched the object is presumed to be liable—even if it had no hand in bringing the harm about. This conclusion is compelled by the Liability Convention’s apparent silence on the matter of intervening acts by third parties and its plain text.³ The Liability Convention’s blindness to the possibility of intervening acts and its consequent misattribution of responsibility is nonsensical in the current context of human endeavors in space. Moreover, such a result is inconsistent with well-established background principles of international law regarding state responsibility and with

¹ The global positioning satellite network system (GNSS or GPS) is one particularly well-known example. GPS is responsible for trillions of dollars in economic benefits in the U.S. alone, *see* NAM D. PHAM, THE ECONOMIC BENEFITS OF GLOBAL NAVIGATION SATELLITE SYSTEM AND ITS COMMERCIAL AND NON-COMMERCIAL APPLICATIONS 12, Table 5 (2013), and is available to any person with access to the internet. The European GNSS Agency estimates that there will be nearly as many GPS receivers as there are humans on Earth by 2022. EUROPEAN GNSS AGENCY, GNSS MARKET REPORT 5 (2013), <http://perma.cc/36ZW-TYUB>.

² Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies, art. VII, January 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 8843 [hereinafter Outer Space Treaty].

³ Convention on International Liability for Damage Caused by Space Objects, art. II, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 13810 [hereinafter Liability Convention].

international law analogues. These considerations weigh in favor of re-examining the Liability Convention's terms.

Like much international law, the purpose of the law of space is to permit orderly settlement of disputes between nations and to deter or equitably redress harm. The Liability Convention accomplishes the former objective by imposing a simple regime of strict liability—there is no dispute about who is legally responsible for harm under the regime. The Liability Convention fails to accomplish the latter goal, however, because its operation in cases involving intervening third parties is so inconsistent with basic principles of state responsibility that the preordained loser of a dispute would have no reason to consent to pay compensation. Moreover, the Liability Convention's terms ironically cannot possibly hold the most proximate cause of harm in these situations—the archetypical “Holmesian bad man”—liable for it.⁴ The Liability Convention thereby fails to deter bad actors and instead incentivizes frontier justice, inviting more disorderly conflict rather than avoiding and settling disputes.

Given that astronauts are effectively the sailors of space (and satellites are akin to their ships), an analogy to the law of the sea may help demonstrate the shortcomings of current space law. The customary law of war at sea provides that whichever state takes control of a ship via capture also assumes ownership and responsibility for it.⁵ Moreover, under the U.N. Convention on the Law of the Sea, individuals who seize ships for private ends are pirates subject to any penalties an apprehending state sees fit, and their stolen ships are understood to be pirate ships while under pirate control.⁶ Importantly, no positive international liability regime is necessary to address the acts of pirates (on Earth or otherwise).⁷ Thus, the customary law of the sea comprehends that responsibility for harm flows not from ownership, but from effective control. No such provision exists in the law of space. Therefore, states that launch satellites are held responsible for the harm

⁴ In other words, an actor or state may rationally calculate how much harm it can cause to its adversaries before the law attributes blame and punishment to it. As this Comment will illustrate, the current liability regime permits the Holmesian bad man to cause considerable harm without fear of legal liability. This, in turn, should encourage the reader to critically examine the incentives the regime creates through its own terms. See Oliver Wendell Holmes, Jr., *The Path of the Law*, 10 HARV. L. REV. 457 (1897).

⁵ The Laws of Naval War Governing the Relations Between Belligerents: Oxford Manual on Naval Warfare (Aug. 9, 1913), art. 102 [hereinafter Oxford Manual]; see also THE OXFORD HANDBOOK OF THE LAW OF THE SEA 313 (Donald R. Rothwell et al. eds., 1st ed. 2015).

⁶ United Nations Convention on the Law of the Sea, art. 101–05, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

⁷ Anyone who engages in piracy or who incites or intentionally facilitates piracy is a pirate and is subject to any penalty an apprehending state sees fit. *Id.* at art. 101. If this understanding of piracy is exported to space, then anyone who commandeers a satellite for private purposes is similarly *hostis humani generis*—an enemy of mankind. Thus, this Comment is primarily concerned with the acts of states, though complications arising from identifying the bad actor will also be considered.

caused by those satellites, even though they would not be held responsible if the harm was caused by a hijacked boat in the analogous context of sea piracy.

The Liability Convention's inconsistency with analogous international law and its allowance for guilty third parties to escape legal liability, considered together, is what this Comment terms the "liability loophole." As this Comment will demonstrate, even though the current regime provides a convenient rule for apportioning liability by imposing strict liability on launching states, the liability loophole reduces the Liability Convention's coherency and effectiveness. Consequently, the Liability Convention deserves review and amendment.

This Comment addresses the problem of misattribution of responsibility and proposes several methods of closing the liability loophole. Section II of this Comment provides a brief account of the history of the law of space, offers a hypothetical to orient the reader, and explores the only incident in which the Liability Convention's terms were invoked. Next, Section III examines changes in circumstances that cast the operation of the Liability Convention in doubt. Section III then argues that in order to remain consistent with its goals, the Liability Convention should adapt to those changed circumstances. Section III also reveals that the present operation of the Liability Convention creates the liability loophole and invites abuse. After that, Section IV illustrates how the Liability Convention works in practice by examining a detailed hypothetical scenario that demonstrates the Liability Convention's shortcomings. Section V offers recommendations concerning ways to close the loophole and make the liability regime comport with settled principles of international law. Additionally, Section V anticipates and addresses several critiques of solutions offered by this Comment that proponents of the Liability Convention would likely offer in its defense. Finally, Section VI articulates this Comment's conclusion: amendment of the Liability Convention is necessary in order to make it consistent with other international law, return it to workability, and deter bad actors from causing harm.

II. BACKGROUND OF THE PRESENT LIABILITY REGIME

The Outer Space Treaty and the Liability Convention have their roots in a prior international covenant: the 1944 Convention on International Civil Aviation, more commonly known as the Chicago Convention.⁸ The Chicago Convention served as a successful proof-of-concept for international agreements that attempt to solve complex collective-action problems related to territorial sovereignty and issues regarding state responsibility for objects used in transportation.⁹ Building

⁸ Convention on International Civil Aviation, Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295.

⁹ Christopher Daniel Johnson, *The Outer Space Treaty*, OXFORD PLANETARY SCIENCE RESEARCH ENCYCLOPEDIA, <http://perma.cc/GG8H-8Q7S>.

on that model, U.S. President Lyndon B. Johnson asked the U.S. Ambassador to the U.N. to begin drafting a treaty with terms for the organized use of space.¹⁰ The goal was to create an instrument that was agreeable to other nations—principally the Soviet Union—and thereby ensure continued peace on Earth and in space.¹¹

The U.S. and the Soviet Union both proposed versions of a space treaty to the U.N. in 1966, and later that year the two submissions were merged into a single document.¹² The Outer Space Treaty was thereafter made available for signature in 1967.¹³ It was ratified by the U.S. and the Soviet Union in October of 1967.¹⁴ It has since been ratified by 61 countries and acceded to by 36 others.¹⁵ Within the Outer Space Treaty's provisions is the following seminal declaration:

Each State Party to the Treaty that launches or procures the launching of an object into outer space . . . and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.¹⁶

This theory of strict liability based on an object's ownership was later elaborated upon and given an exception by the Liability Convention.

The Liability Convention was designed to build upon the terms of the Outer Space Treaty and broadly defines "damage" as "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations."¹⁷ Moreover, Article II of the Liability Convention declares 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 flight."¹⁸ Article III explains that in the slightly different context of damage caused to a space object or its contents by a space object of another launching State, "the latter shall be

¹⁰ *Id.*

¹¹ *Id.*

¹² *Outer Space Treaty*, ENCYCLOPEDIA BRITANNICA (2018).

¹³ *Id.*

¹⁴ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205.

¹⁵ *Id.*

¹⁶ *Outer Space Treaty*, *supra* note 12, at art. VII.

¹⁷ *Liability Convention*, *supra* note 3, at art. II.

¹⁸ *Id.*

liable only if the damage is due to its fault or the fault of persons for whom it is responsible.”¹⁹ Of particular note is Article VI, which posits that:

exoneration from absolute liability shall be granted to the extent that a launching state establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents.²⁰

It should be noted at this juncture that the clunky language of Article VI leaves it open to interpretation. Under the terms of that Article, it may be that the launching state is not responsible for harm caused by a satellite when there is an act or omission done with intent to cause damage “experienced by” a claimant state.²¹ This interpretation of the language would permit claims commissions formed under the Liability Convention to consider more equitable attributions of responsibility in instances of intervening acts that cause harm; but this interpretation does not flow as easily from the language of the treaty. Instead, the language used therein seems to be in accordance with the phrase’s typical meaning: “by or from (someone).”²² The importance of this provision will be discussed in more detail in Section V.

Though the Liability Convention embodies laudable goals, it is simply unequipped to deal with the significant changes in technological capabilities and international espionage that are embodied by the rising prevalence of cyberwarfare.²³ Considered together with contemporary technology, the Liability Convention’s provisions mean the following: when a satellite belonging to Country A is manipulated by third-party Actor X and hits a satellite belonging to Country B, and Country B’s satellite then causes damage to Country C on Earth, Country B will probably be liable for that harm even if Country B can show that the damage was not within Country B’s control. This is because Country B’s satellite “caused” harm on Earth, and no exoneration is possible if Country C did

¹⁹ *Id.* at art. III.

²⁰ *Id.* at art. VI.

²¹ See Definition of ‘On the Part of sb/On sb’s Part,’ CAMBRIDGE DICTIONARY, <http://perma.cc/2YHR-T4NX>.

²² See Definition of ‘On the Part of (someone),’ MERRIAM-WEBSTER, <http://perma.cc/8QLS-6Z3B>.

²³ Cyberwarfare is a broad term that refers generally to operations with the goal of hostile exploitation of networked infrastructure within or belonging to a state. As Michael Schmitt has explained, “hostile cyber operations directed against cyber infrastructure located on another state’s territory, whether government owned or not, constitute, inter alia, a violation of that state’s sovereignty whenever they cause physical damage or injury.” Michael N. Schmitt, *The Law of Cyber Warfare: Quo Vadis?*, 25 STAN. L. & POL’Y REV. 269, 274–75 (2014). Though there is disagreement about line-drawing, such activity is increasingly understood by international law experts as a potential legal equivalent to the use of physical force under those circumstances. *Id.* at 281. The same principles are easily exported to objects under the jurisdiction of a state in space, like networked satellites. For a well-known example of cyberwarfare, see Kim Zetter, *An Unprecedented Look at Stuxnet, the World’s First Digital Weapon*, WIRED (Nov. 3, 2014), <http://perma.cc/ZU39-2RDZ>.

not bring the harm upon itself. Moreover, Country A would likely not be liable to Country B because the damage to Country B's satellite was not due to the fault of Country A. Even though Country B would be unable to collect restitution from Country A, it is conceivable that Country A's satellite is the "cause" of harm on Earth. Therefore, between Country A and Country B, a great deal hinges on the meaning of "cause" in the Liability Convention.

However, regardless of which country's space object is understood to have "caused" the harm on Earth, the fact of the matter is that the true proximate cause of harm, Actor X, will not be held liable or deterred. Thus, either Country A or Country B will be stuck with the bill for Actor X's interference despite having exerted no control over the situation—a result that would not follow under the customary law of the sea. Due to this inconsistency with longstanding customary law, and without direct responsibility for causing the harm at issue, it is unlikely that a state party will be willing to pay for harm brought about by another actor.

Thus, the effects of the Liability Convention's terms are now being tested like never before for their consistency with other areas of international law. Not only this, but achieving the Liability Convention's goals of ensuring "the prompt payment . . . of a full and equitable measure of compensation" and creating "effective international rules and procedures concerning liability" may be increasingly elusive.²⁴ Looking now to history, the Liability Convention's prospects in these respects indeed seem grim: during the single, simple incident in which the Liability Convention's terms were invoked, the Liability Convention failed to create the effects its framers intended.

This incident was the Cosmos 954 fiasco of 1978. That year saw the first time that harm caused by a satellite resulted in an international legal dispute.²⁵ This episode began when a Soviet satellite inadvertently fell to Earth in uninhabited Canadian territory. After Canada presented a claim for damages based in part on the Liability Convention's terms, Canada and the Soviet Union engaged in negotiations regarding compensation for the cleanup of the radioactive satellite debris that fell on Canadian land.²⁶ Arguments between the two nations were principally based on norms of international behavior, and the terms of the Liability Convention were invoked but largely ignored or, at best, considered only in the background.²⁷ This is because the Canadian claim under the Liability Convention stood on somewhat shaky ground: radioactive debris from the Soviet Cosmos 954

²⁴ Liability Convention, Preamble, *supra* note 3.

²⁵ Alexander F. Cohen, *Cosmos 954 and the International Law of Satellite Accidents*, 10 YALE J. INT'L L. 78, 89 (1984).

²⁶ Joseph A. Burke, *Convention on International Liability for Damage Caused by Space Objects: Definition and Determination of Damages After the Cosmos 954 Incident*, 8 FORDHAM INT'L L. J. 255, 256 (1984).

²⁷ Cohen, *supra* note 25.

satellite landed in uninhabited Canadian land and Canada's claim was the cost of cleanup rather than property damage, so it was not clear that the terms of the Liability Convention controlled.²⁸

One would expect that where nations disagree about the meaning of terms in an international instrument, they would submit their claim to the arbitrator prescribed by the convention to resolve such disputes. However, the Canadian claims ultimately did not go before a claims commission established under the Liability Convention.²⁹ Instead, the countries agreed on a terse diplomatic solution after the U.S. assisted Canada in debris cleanup and the Soviet satellite remnants were transferred to the U.S.³⁰ Thus, even though the Cosmos incident was about as straightforward as a scenario involving disagreement over the Liability Convention's terms can be, invoking the Liability Convention served only as an intermediary step in the negotiation of a final outcome. The Liability Convention failed to serve its purpose of establishing an effective procedure for resolving international disputes—it was relegated to operating solely in the background.

Though it is only one example, the Cosmos 954 incident is illustrative of the larger trend: states party simply do not rely on the Liability Convention's procedures, even when they may be applicable. The Liability Convention conflicts with the integral principle of international law that control gives rise to responsibility. That conflict may play a part in explaining state non-reliance, but the simple fact of the matter is that the Liability Convention has plainly not seen successful use. Given that the instrument was designed to be the basis for dispute resolution when satellites are involved, that ought to be troubling.

III. SETTING SAIL FOR DISASTER: PRACTICAL AND CONCEPTUAL PROBLEMS FOR THE LIABILITY CONVENTION

The process by which a claim should be settled under the Liability Convention is rather simple in the abstract. First, some form of actionable harm occurs. Then, a claim by the damaged state is presented to the responsible space object's launching state within one year.³¹ Diplomatic negotiations are expected to take place thereafter.³² If negotiations fail, a claims commission is then constituted by three arbiters who are to be chosen within two months: one by

²⁸ In other words, property that is valuable and capable of deterioration in value. The land at issue in the dispute was uninhabited tundra. Burke, *supra* note 26, at 276–77.

²⁹ *Id.* at 277.

³⁰ *Id.* at 279.

³¹ Liability Convention, *supra* note 3, at art. X.

³² *Id.* at art. XIV.

each party (or collection of parties) and one chosen jointly.³³ If one state does not participate in choosing the arbiters for four months, the other may request that the Secretary-General of the U.N. appoint a single arbiter within two months.³⁴ This commission then issues its decision within one year, which shall be final and binding if both parties (or collections of parties) consent; otherwise it is a recommendation.³⁵

As this process demonstrates, the Liability Convention's goal of determining proper restitution for harm is dependent on good-faith cooperation and collaboration between the states party involved. If there is concurrent armed conflict between the relevant states party, claims are unlikely to be successfully compensated; and if the armed conflict lasts for more than a year, the damaged state's claim will likely expire unless it requests that a claims commission be established.³⁶ Without the launching state's consent, this would create a one-arbitrator commission in line with Article XVI of the Liability Convention.³⁷ In such a scenario—that is, without the participation and consent of the launching state—the findings and decision of the commission would serve only as a recommendation to be considered in good faith.³⁸ Perhaps such a decision could be used as leverage in peace treaty negotiations, but that point is fairly speculative. In short, if the launching state is hostile to the victim state or if it determines that the liability regime is unfair as applied to launching states generally, it will simply not participate in dispute resolution. This undermines the very purpose of the Liability Convention.

A. The Issue of Intervening Actors: Practical Problems for the Liability Convention

The Liability Convention's critical dependence on good-faith negotiation is not the only mechanical difficulty the liability regime faces. The Liability Convention has sweeping terms; but its regime of strict liability does not adequately address the problem presented by space objects deorbiting or otherwise causing harm on Earth due to intervening causes. Unless a state brought harm upon itself by a grossly negligent action or omission, the state that launched the damage-causing satellite is either singularly or jointly liable for any injury,

³³ *Id.* at arts. XV, XVII.

³⁴ *Id.* at art. XV.

³⁵ *Id.* at art. XIX.

³⁶ *Id.* at art. XIV.

³⁷ *Id.* at art. XVI.

³⁸ *Id.* at art. XIX.

depending on whether the space object was launched jointly with another state.³⁹ This appears to be inequitable at best and creates perverse incentives for a bad actor to use the satellites of other nations as leverage and weapons at worst.

The Liability Convention's stubborn adherence to a rule of strict liability which does not take agency into account can be explained by the fact that the framers of the existing international liability regime considered "[n]o other exceptions to the principle of absolute liability, such as armed conflict, civil disturbance, insurrection, or acts of a third party."⁴⁰ Perhaps this is unsurprising: In a period of time when only two countries were realistically capable of maintaining major space programs, it was probably easy for the framers to assume that the overwhelming majority of space objects would be controlled by one of those two countries or otherwise be jointly launched by one of the two in partnership with states within their respective spheres of influence. It could have been efficient for the Liability Convention's framers to simply chalk a given instance of harm up to one state or the other according to whichever launched the harmful object into space rather than try to prescribe or predict how agency would be factored into the legal framework later on.

However, it is becoming increasingly clear that the current strict liability regime does not make sense in a multi-polar world where some fifty-four countries have launched satellites of various kinds, to say nothing of the regime's inconsistency with customary international law regarding the analogous act of piracy.⁴¹ The liability regime must be amended so that it may achieve its goals, remain an effective route for dispute resolution, and maintain consistency with longstanding principles of state responsibility in international law—in particular, the principle imbedded in the law of the sea and in customary international law that state responsibility flows from effective control.⁴² These considerations have yet to be taken up by any influential legal authority, and so the terms of the Liability Convention remain open to some interpretation in this respect. Before changes to the regime are proposed, though, it is necessary to lay out in more detail the recent changes that have brought the effectiveness of the Liability Convention and the means chosen by its framers into question.

³⁹ *Id.* at arts. V, VI.

⁴⁰ Mohamed Abdulgader Tumi, *Space Law: International Liability for Damages Caused by Space Objects—The 1972 Liability for Damages Convention* 174 (Sept. 30, 1984) (unpublished L.L.M. thesis, George Washington University National Law Center).

⁴¹ *Notifications from States & Organizations*, U.N. OFF. FOR OUTER SPACE AFF., <https://perma.cc/ETA5-3MVA>.

⁴² UNCLOS, *supra* note 6, at arts. 101–05; *see* G.A. Res. 56/83, Responsibility of States for Internationally Wrongful Acts, arts. 17–18 (Jan. 28, 2002); *see also id.* at art. 23.

1. The bar to entry to space has been lowered, and commercialization of space is now nigh-universal.

The character and volume of human activities in space have changed substantially since the advent of the Liability Regime in ways that could not have been easily foreseen by the Liability Convention's drafters. Since 1967, many additional countries besides the U.S. and the Soviet Union have sent materials and astronauts to space. The International Space Station, for instance, is made of components constructed by six countries (plus the European Union).⁴³ According to the U.N., 54 countries and two international organizations have registered satellites in space.⁴⁴ Analysis of reports submitted to the U.N. Office for Outer Space Affairs shows that a total of 8,126 satellites have been launched and that twenty-two percent of these objects were launched in the last eight years.⁴⁵ The most recent data suggests that there are 4,987 satellites currently orbiting Earth, and that of these satellites, 1,957 are active.⁴⁶ The majority of active satellites are commercial in nature.⁴⁷

Thus, commercial use of space is now incredibly widespread; to say nothing of the fact that accessing space has become immensely easier since the late 20th century. Private space companies have received overwhelming economic support and investment. Private investors injected about 3.9 billion dollars into commercial space companies in 2017, and today's commercial rockets are proving to be more reliable and more cost-effective than those designed by states, spurring privatization and commercialization onward.⁴⁸ Indeed, the privatization of space exploration and rocket development has progressed apace in recent years: firms such as SpaceX are setting and achieving ambitious goals like hosting more launches than any government agency and placing a network of internet service satellites in orbit within a matter of years.⁴⁹ So strong is American public optimism and faith in companies like SpaceX, Blue Origin, and Virgin Galactic that an

⁴³ *International Space Station Components*, SMITHSONIAN NAT'L AIR & SPACE MUSEUM, <http://perma.cc/4WHK-DSWT>.

⁴⁴ *Notifications from States & Organizations*, *supra* note 41.

⁴⁵ Andrew Lavender, *How Many Satellites are Orbiting the Earth in 2018?*, PIXALYTICS (Aug. 22, 2018), <http://perma.cc/PKR8-GG44>.

⁴⁶ Andrew Lavender, *How Many Satellites are Orbiting the Earth in 2019?*, PIXALYTICS (Jan. 16, 2019), <http://perma.cc/WQM5-Y4DC>.

⁴⁷ *Id.*

⁴⁸ Michael Sheetz, *Space Companies Received \$3.9 Billion in Private Investment During 'the Year of Commercial Launch': Report*, CNBC (Jan. 18, 2018), <http://perma.cc/Y4WA-6HXT>.

⁴⁹ Dave Mosher, *Elon Musk: SpaceX Will Launch More Rockets than any Nations on Earth this Year*, BUSINESS INSIDER (May 11, 2018), <http://perma.cc/5V8W-ZSKC>; Rich McCormick, *SpaceX Plans to Launch First Internet-Providing Satellites in 2019*, THE VERGE (May 4, 2017), <http://perma.cc/27BE-DTZY>.

overwhelming 81 percent of those surveyed believe that these companies will make a profit.⁵⁰ Of those who are “highly attentive to space news,” over 90 percent believe that private companies will build safe and reliable spacecraft or control costs when doing so.⁵¹

However, the rapid commercialization of space is not purely positive. Even with this valuable exploitation of space for human ends, the increasing volume of satellites in space also means that there is a greater likelihood of something going awry in space and causing harm on Earth. Perhaps much more distressing is that the rapid development of both extensive computer networks and methods of waging cyberwar means that as time goes on, an expanding number of satellites will become increasingly vulnerable to abuse by sophisticated states or third parties. This abuse and cooption by third parties via cyberwarfare is a concept discussed below in Section 3.

2. Militarization of space has kept pace with commercialization.

The increasing trend of militarizing space is of particular concern. Although the U.N. General Assembly adopted Resolution 70/27 (“No First Placement of Weapons in Outer Space”) as recently as 2015, the perennial and chief difficulty in preventing and addressing the militarization of space is that in the modern world, even ordinary commercial or waste-disposal satellites can be converted rather easily into makeshift weapons by sophisticated actors.⁵² In recognition of these facts, the U.S. Air Force maintains a unit dedicated solely to space operations, and the recent proposal for a U.S. Space Force was made in response to the increasing activity of other states in space.⁵³ This Space Force will be tasked with developing weapons and countermeasures in anticipation of warfare in the realm of space.⁵⁴ As more complex space-based weapon systems and countermeasures are developed, satellites used for military purposes will likely have ever-increasing capabilities to cause harm beyond simply falling to Earth.⁵⁵ Both potential and direct militarization of space are thus becoming more likely by the day.

⁵⁰ Brian Kennedy & Mark Strauss, *Many in U.S. Have Confidence in What Private Space Companies Will Accomplish*, PEW RESEARCH CENTER, (Jun. 22, 2018), <http://perma.cc/7DUM-4TFH>.

⁵¹ *Id.*

⁵² See Brian G. Chow, *Space Arms Control: A Hybrid Approach*, 12 STRATEGIC STUD. Q. 107, 113 (2018).

⁵³ Garrett M. Graff, *The New Arms Race Threatening to Explode in Space*, WIRED (June 26, 2018), <http://perma.cc/X48Z-KRKG>.

⁵⁴ Will Thomas, *Trump Signs National Defense Authorization Act for Fiscal Year 2019*, AM. INST. PHYSICS (Aug. 17, 2018), <http://perma.cc/C23G-WGRN>; George Dvorsky, *Here's the Official Plan to Create the U.S. Space Force*, GIZMODO (Aug. 9, 2018), <http://perma.cc/K856-7YFW>.

⁵⁵ Alex Hern, *Hacked Satellite Systems Could Launch Microwave-like Attacks, Expert Warns*, THE GUARDIAN (Aug. 9, 2018), <http://perma.cc/5XA3-UM8V>.

While Article IV of the Outer Space Treaty forbids weapons of mass destruction from being placed into space, the definition of such weapons in the treaty is notably vague, and several proposals for plausibly-compliant satellite-based weapon systems capable of extreme harm have existed for decades.⁵⁶ Even without these ticking time bombs floating in space, however, a large number of satellites are currently used for military purposes. As of 2018, according to the Union of Concerned Scientists, the U.S. military uses over 170 satellites, Russia operates 97 military satellites, and China's military controls 100.⁵⁷

China demonstrated in 2007 that it could shoot down a satellite using a land-based anti-satellite missile; the U.S. performed the same feat in 2008.⁵⁸ As a practical matter, these weapon systems may help mitigate damage from falling satellites and may also serve as a form of self-defense. However, these missiles have not seen use outside of very well-controlled experiments, and their efficacy in live-fire situations is therefore unknown. Thus, one should not confuse advances in the destructive potential of military technology in space with an equal pace of development with regards to countermeasures.

Space may well be the site of the next arms race, akin to the nuclear arms race of the Cold War.⁵⁹ And similar to the deterrent and de-escalation effect of Cold War treaties on the U.S. and Soviet Union, even those nations that might have the potential to protect themselves in the future may end up needing to rely on provisions of international law if things go wrong. In that event, the Liability Convention must be workable and sensible. In short, new technologies do not abrogate the necessity of a legal instrument that establishes order and deters aggression in what would otherwise be a chaotic affair.

3. Cyberwarfare capabilities are expanding and are being increasingly oriented towards space.

Even putting aside the overtly increasing militarization of space, the growing commercialization of space and volume of human space activities are of particular importance when considering the threat posed by cyberwarfare—a concept the early drafters of the international law of space likely regarded as akin to science-fiction. Traditional military technologies like missiles and satellites are not the only beneficiaries of recent developments; cyberwarfare is also becoming far more advanced. It is now possible for purely commercial satellites to be turned into

⁵⁶ Outer Space Treaty, *supra* note 12, at art. IV; Jonathan Shainin, *Rods from God*, N.Y. TIMES MAG. (Dec. 10, 2006), <http://perma.cc/B3CB-CMPX>.

⁵⁷ UCS Satellite Database, UNION OF CONCERNED SCIENTISTS, <http://perma.cc/C6M4-AWN2> (last updated Jan. 9, 2019).

⁵⁸ Graff, *supra* note 53.

⁵⁹ *Id.*

weapons or be used in support of an armed attack on Earth—even if that was not part of their original design—by a sophisticated actor or state.⁶⁰ The rapid commercialization of space also means that there are now several more tools for bad actors to take advantage of.

To further demonstrate the danger that even necessary and innocuous satellites may pose if they are abused, consider that satellites designed for space junk cleanup or servicing of other satellites can also be “readily commanded to grapple and destroy an adversary’s satellite.”⁶¹ Currently, the primary proposed method of space junk cleanup is to use a satellite to drag other, smaller satellites or assorted objects into the Earth’s atmosphere, causing a gradual and complete burn-up of the junk.⁶² Cleanup satellites such as these may eventually be designed to be capable of creating sufficient thrust to de-orbit even a larger satellite by grappling it and decelerating. Given this, “accidents” could be strategically manufactured by bad actors through subtle or sudden manipulation of cleanup satellites—even those not belonging to them. Under the Liability Convention’s terms, akin to the hypothetical orientation scenario offered in Section II, the owner of the de-orbited satellite would likely be on the hook for any harm caused on Earth. The real bad actor would face no legal responsibility for the harm they caused.

Perhaps just as concerning, there is a real possibility that a similar bad actor could gain access to and take control of the functions of a military satellite—especially one that happens to be armed—via hacking and use its capabilities to cause harm to its owner or another state on Earth. This sort of “false flag” operation has been the subject of military fiction in other contexts for decades.⁶³ This is to say nothing of the prospect of taking direct control of and de-orbiting a large satellite onto a target country via methods of cyberwarfare, as has been demonstrated to be possible—albeit unlikely to be successful at present.⁶⁴

The motivations behind identified incidents of satellites being compromised via methods of cyberwarfare are largely unknown, and data about them is far from comprehensive. Even so, sophisticated hackers that target military assets are widely suspected to be working on behalf of state governments (as modern equivalents to privateers).⁶⁵ It is also conceivable that in any given instance the

⁶⁰ Hern, *supra* note 55.

⁶¹ Chow, *supra* note 52, at 108.

⁶² Tony Reichhardt, *SpaceX Cargo Ship Will Carry First Test of Space Debris Cleanup*, SMITHSONIAN AIR & SPACE MAG. (Mar. 30, 2018), <http://perma.cc/2BYS-DHED>.

⁶³ See, for example, TOM CLANCY, RED STORM RISING (1986).

⁶⁴ Charles Arthur, *Chinese Hackers Suspected of Interfering with US Satellites*, THE GUARDIAN, (Oct. 27, 2011), <http://perma.cc/PB92-CT5R>.

⁶⁵ *Id.*

cyber-attackers are instead operating as lone wolves (effectively, as pirates) and hope to damage the assets of a state for reasons unrelated to state interests or to hold those assets for ransom. In fact, one hacker group claimed it had attempted to do just this to the U.K. in 1999.⁶⁶

The very real danger posed by advances in cyberwarfare is illustrated by the following recent incident: in June 2018, Chinese computers—though not definitively the Chinese government—were involved in an operation that took over some functions of “computers that controlled [U.S. military and commercial] satellites, so that they could have changed the positions of the orbiting devices and disrupted data traffic.”⁶⁷ It should be noted that, as incidents like this are a fairly new phenomenon, only limited data on the number of hacking incidents has been collected so far.⁶⁸ However, *Wired* characterized recent instances of satellite hacking by Chinese computers as a “clandestine but incessant hacking campaign[]” that continues “between the [U.S.] and China.”⁶⁹ Indeed, both China and the U.S. have been “very heavily focused on” securing and stealing information regarding “military trade secrets, military preparedness, military readiness, [and] satellite communications.”⁷⁰ In the incident described above, the hackers “spent the most time . . . on the satellites” observing systems involving “command and control” and “the operational side for both . . . geospatial imagery and . . . telecom[munications].”⁷¹ In brief, the hacker infiltrated the control systems of the satellite and was able to observe all of the satellite’s activities unimpeded.

It is deeply concerning that the change in focus towards conducting cyberwarfare in space is present on both sides of the Pacific: the mission of the 30,000 members of the U.S. Air Force Space Command was previously to oversee cyber and information warfare, but has recently changed to “provid[ing] resilient and affordable space capabilities for the Air Force.”⁷² These developments indicate that powerful states are preparing to make space the next theater of war. Indeed, the utility of waging cyberwar instead of physical shows of force has become common knowledge in national security circles. As one security expert

⁶⁶ *Satellite Hijack ‘Impossible,’* BBC, (Mar. 2, 1999), <http://perma.cc/39KK-5X5B>.

⁶⁷ Joseph Menn, *China-based Campaign Breached Satellite, Defense Companies: Symantec*, REUTERS (Jun. 19, 2018), <http://perma.cc/AR7U-WDF9>.

⁶⁸ See Adam Ali Zare Hudaib, *Satellite Network Hacking & Security Analysis*, 10 INT’L J. OF COMPUTER SCI. & SECURITY 8 (2016).

⁶⁹ Lily Hay Newman, *China Escalates Hacks Against the US as Trade Tensions Rise*, WIRED (Jun. 22, 2018), <http://perma.cc/L6EU-N45D>.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² *Heritage*, UNITED STATES AIR FORCE SPACE COMMAND, <http://perma.cc/R9AS-MFA7>.

put it: “Hacking can be used as a sign of force in a lot of cases to say ‘hey, we’re not happy and we’re going to make you feel some pain’ . . . [States] use that as a first step instead of having to send fighter jets.”⁷³ Thus, cyberwarfare is becoming an increasingly common substitute for and possible precursor to the use of force, rather than simply a complex form of spying—and those methods are now being used in space rather than solely on Earth.

While all of this may seem akin to science fiction or fearmongering to the casual reader, both citizens and lawmakers should be concerned about the extent to which the existing legal regime fails to account for the fact that satellites may now be used to cause harm on Earth in new ways. As Vikram Thakur, the technical director of the top-tier cybersecurity firm Symantec, explained recently in an interview: “Disruption to satellites could leave civilian as well as military installations subject to huge disruptions . . . We are extremely dependent on their functionality.”⁷⁴ The grave threat of cyberwarfare being waged in space necessarily raises questions about how responsibility can and should be apportioned when those acts of cyberwarfare result in harm.

It is now clear that the world’s satellite infrastructure is currently vulnerable to sophisticated parties well-versed in methods of cyberwarfare, whatever their motivations might be. Thus, the threat that a launching state’s satellite might be appropriated in order to be dropped on another state or on the launching state itself by a third party is no longer relegated to the realm of fiction. In anticipation of such an event, the international liability regime should not be structured so as to allow that bad actor to walk away scot-free. At the very least, the international liability regime should not have the guaranteed outcome of forcing a completely innocent state to foot the bill for the bad acts of another, as it currently does.

B. A Matter of Principle: Conceptual Problems for the Liability Convention

The rising number of space objects in the modern era coupled with the increasing ability of states and even private actors to take control of normally-innocuous satellites means that the incentives created by the existing strict liability regime urgently need to be reexamined. A liability regime that punishes an innocent launching state for an intervening third party’s use of a satellite to cause harm is incompatible with recognized basic principles of state responsibility that recognize that control, not ownership, is the core element of responsibility.⁷⁵ Not

⁷³ *Id.*

⁷⁴ Menn, *supra* note 67.

⁷⁵ These include doctrines that expand responsibility beyond the actor state alone, such as when the actor state is subject to another nation’s direction and control or is being coerced by another nation.

only this, but such attribution of responsibility is similarly incompatible with the analogous customary law of the sea, which also connects responsibility with control instead of ownership.⁷⁶ The Liability Convention thus fails to maintain consistency with other bodies of international customary law and is unable to actualize its motivating principles in situations involving intervening acts by third parties.

Furthermore, the Liability Convention's focus on strict liability is not only inconsistent with the general understanding of state responsibility in international law, but also creates an unworkable standard that is highly unlikely to be enforced or relied upon. At present, instead of properly attributing responsibility for harmful acts, the Liability Convention's terms seem to incentivize the Holmesian bad man's use of another state's satellites to cause harm to his own rivals precisely because he will not be made to pay for it. Instead of holding the bad actor accountable, the regime's rules force an innocent launching state to pay restitution to any other state that was harmed by a third party's use of the launching state's satellites as destructive tools. Such absurd ownership-based punishment makes little sense if the Liability Convention's purpose is to create "effective international rules and procedures concerning liability" that strengthen "international co-operation."⁷⁷ Presently, it would be unreasonable for launching states, which face a near-guarantee of liability in these situations, to cooperate and pay restitution without some sort of security for when they are not at fault. Because of this, the result of the regime may well be more international tension and armed conflict instead of dispute resolution.

It should also be noted that the Liability Convention's terms have no textual exception for acts of war, meaning that even incidents during wartime still fall under its provisions.⁷⁸ However, the Liability Convention is unlikely to prevent acts of war. It is overwhelmingly improbable that a perpetrator of a premeditated act of war will be willing to compensate a victim state while a war between them is ongoing. Additionally, the longstanding custom in armed conflict is that each state determines how restitution will be paid to its own citizens harmed by acts of war.⁷⁹ Thus, if a state makes an attack using a space object and such attack constitutes an act of war, the problem of uncompensated harm will still exist in

There are also doctrines that reduce responsibility when control over an act is not possible, as in the case of force majeure. See G.A. Res. 56/83, *supra* note 42, at arts. 17–18; see also *id.*, at art. 23.

⁷⁶ See Oxford Manual, *supra* note 5, at art. 102; see also UNCLOS, *supra* note 6.

⁷⁷ Liability Convention, *supra* note 3, Preamble.

⁷⁸ Tumi, *supra* note 40.

⁷⁹ See Nehemiah Robinson, *War Damage Compensation and Restitution in Foreign Countries*, L. & CONTEMP. PROBS. 347 (1951). Violent acts committed by non-state actors have been similarly compensated—though not in every case. See LLOYD DIXON & RACHEL KAGANOFF STERN, *COMPENSATION POLICIES FOR VICTIMS OF TERRORISM* (2002), <http://perma.cc/HLU2-E3FC>.

the absence of a later treaty between the warring states. A decision by a claims commission called to address a claim under the Liability Convention may play a part in peace negotiations, but it would be unrealistic to assume that it would carry force in the midst of war. Thus, the Liability Convention will not in all cases “ensure . . . the prompt payment . . . of a full and equitable measure of compensation to victims” of damage caused by space objects.⁸⁰

Unfortunately, despite its sweeping terms, the current liability regime probably has its strongest likelihood of being adhered to in the case of an accident involving states party that already engage in regular diplomacy with each other—a case where it is probably least necessary precisely because of that ongoing relationship. However, as the Cosmos 954 incident discussed above illustrates, even states party that have an established diplomatic channel have been highly averse to relying on the terms of the Liability Convention. Although the Liability Convention has the laudable aims of compensating all harm, creating predictability, and establishing orderly resolution of disputes, it presently falls short in achieving its stated goals. The Liability Convention’s terms create predictability at the expense of preventing orderly resolution of disputes, and thereby fail to ensure compensation for harm. Forcing an innocent state to pay for the harm caused by actions of another beyond its control cannot possibly be reconciled with background principles of international law, and doing so therefore threatens the effectiveness of the whole regime. Unfortunately, because the current regime does just that, it invites chaos and disaster.

In light of these considerations, the liability regime created by the Liability Convention should be retooled in order to operate more realistically and fairly. As the above discussion of acts of war shows, it will not be possible to compensate harm caused by satellites in all instances. Moreover, perfect predictability of results is useless if the winner and loser are always preordained but cooperation and consent from both is required. Without the victim’s sanction, the claims commission can do nothing of substance. Instead, the liability regime should ensure that when a nation is at fault for harm caused outside of war, it pays for that harm. The liability regime should similarly ensure that innocent parties—victims of harm and those whose satellites were hijacked alike—bear as little burden as possible. If the launching state has the possibility to receive compensation in turn from the guilty party, it may be more willing to submit to the jurisdiction of the claims commission. At the very least, in no case should the liability regime operate to shield bad actors from liability for the harm they cause. The liability loophole must be closed in order to ensure that justice is served.

⁸⁰ Liability Convention, *supra* note 3, Preamble.

IV. UNDERSTANDING THE LIABILITY LOOPHOLE IN PRACTICE

The liability regime begins to fall apart—even under its own terms—in the case of harm on Earth which is deliberately caused by an unknown party. As demonstrated above, the cause of the harm is an irrelevant consideration for the Liability Convention. The only relevant inquiry is the ownership of the satellite that caused harm on Earth. There is also an additional complication: the Liability Convention’s terms do not neatly prescribe how damage caused on Earth by particularly complex satellites should be handled. Although the existing regime operates fairly smoothly under its own terms for satellites constructed and launched by a single nation, in cases involving complicated satellites made of parts from multiple contributors, each participating state’s liability for harm will be very difficult to determine.

A. A Fully-Armed and Operational Space Station: Stress-testing the Liability Convention’s Mechanics

Perhaps this particular problem would be best demonstrated by a hypothetical scenario. Earth’s heaviest and most complex artificial satellite is the 420-ton International Space Station.⁸¹ As human activity in space becomes more commonplace, it is reasonable to assume that this prominent satellite will serve as a model for future cooperative ventures in space. The downside of this satellite, however, is that NASA estimates that between 53,500 and 173,250 pounds of the International Space Station’s material would survive even a controlled re-entry into Earth’s atmosphere.⁸² Thus, while it has served as a symbol of international cooperation in space, the International Space Station also has immense potential to cause harm on Earth. For these reasons—and because of the unique legal challenges it presents—the International Space Station will be the subject of the following hypothetical scenario.

Suppose now that the International Space Station was deliberately caused to fall from orbit and its remains descended onto an American metropolitan population center, causing immense property damage and loss of life. There is great uncertainty regarding the proper apportionment of liability in the wake of the satellite’s de-orbit. Neither the International Space Station’s own legal framework nor the Liability Convention adequately addresses this concern. Both will be examined in turn.

⁸¹ Mark Garcia, *International Space Station Facts and Figures*, NASA (Apr. 27, 2018), <http://perma.cc/8CMU-BYJN>.

⁸² Joe Pappalardo, *Death Star: The ISS Doesn’t Have a Way to Crash Safely*, POPULAR MECHANICS (Jul. 30, 2018), <http://perma.cc/EMT6-Z4AQ>.

1. The International Space Station's legal framework cannot repel a problem of this magnitude.

The International Space Station's legal framework posits that each state retains ownership of (and thus responsibility for) each part of the space station that it supplies.⁸³ However, this is in direct conflict with the terms of the Liability Convention, which pronounces that responsibility for harm caused on Earth by a space object is based on the object's launching state or is otherwise joint and several between the states involved in launching that space object.⁸⁴ How the International Space Station is defined thus assumes central importance. It is important to note that the International Space Station legal framework recognizes the Liability Convention in its preamble and in Article 17.⁸⁵ In that Article, it explains that "except as otherwise provided in Article 16," the Liability Convention determines liability for any harm.⁸⁶ Article 16 consists of a "Cross-Waiver of Liability."⁸⁷ This waiver explains that claims stemming from any damage caused by "Protected Space Operations" (meaning all launch vehicle activities, space station activities, and payload activities on Earth, in space, or in transit between Earth and space) will be waived by the participating agencies.⁸⁸ Article 16(3)(c) expands this waiver between the contributing states to also cover liability under the Liability Convention.⁸⁹ Thus, a deliberate de-orbit by a malicious actor is clearly not contemplated nor covered by the terms of the cross-waiver—only normal space activities by the contracting states are.⁹⁰

Moreover, Article 17 explains that all partner states will otherwise "remain liable in accordance with the Liability Convention," so the International Space Station legal framework extends only to relationships between the contracting states and effectively evades the issue of apportioning liability for harm on Earth caused by an actor other than one of the contracting states. Even though its explanation of property ownership might have been a helpful tool for apportioning liability, because the ownership principle advanced by the International Space Station legal framework conflicts with the Liability Convention and because it also asserts that states party remain liable in accordance

⁸³ Space Station Agreement Between the United States of America and Other Governments, art. 6(1), Jan. 29, 1998, TIAS 12927 [hereinafter ISS Agreement].

⁸⁴ Liability Convention, *supra* note 3, at art. V.

⁸⁵ ISS Agreement, *supra* note 83, Preamble.

⁸⁶ *Id.* at art. 17(1).

⁸⁷ *Id.* at art. 16-17.

⁸⁸ *Id.* at art. 16(2)(f); *Id.* at art. 16(3).

⁸⁹ *Id.* at art. 16(3)(c).

⁹⁰ *Id.* at art. 16(3)(d)(5).

with the Liability Convention's terms, the International Space Station legal framework does little to resolve the problems presented in this hypothetical.

2. The Liability Convention does not have it where it counts.

The Liability Convention does not seem to anticipate the creation of a complex satellite like the International Space Station. Article V of the Liability Convention speaks of "two or more States jointly launch[ing] a space object" and explains that a "[s]tate from whose territory or facility a space object is launched shall be regarded as a participant in a joint launching."⁹¹ However, the Liability Convention appears to reference singular launching events in these clauses, not a program of launches like that which resulted in the construction of the International Space Station. The Liability Convention does not contemplate the possibility that several objects launched into space over a period of time by multiple nations may be joined together into a single functional whole.

Additionally, the Liability Convention's focus on space objects does not draw a helpful definitional line in the context of complex satellites. The International Space Station is a collection of several modules which were themselves space objects before being put together. A "space object" is defined to include "component parts of a space object as well as its launch vehicle and parts thereof," but there appears to be no consideration of the possibility that individual satellites might be intended as parts of a larger whole.⁹² Thus, it is difficult to explain what exactly the International Space Station is for the purpose of attributing liability according to the Liability Convention.

To elaborate, if the International Space Station is made up of "component parts" that are themselves space objects, it remains unclear if all those space objects are in turn amalgamated into the International Space Station once they are physically connected or if they remain separate for the purposes of liability.⁹³ If the International Space Station is assumed to be a single space object for the purposes of the Liability Convention, there is still the question of which nation is the responsible launching state. Of course, because multiple nations collaborated on putting the satellite together over time, it would be considerably unfair to arbitrarily assign a single nation as designated responsible launching state. Thus, the single launching state category probably does not adequately cover the International Space Station.

Alternatively, it might be asked whether "two or more states jointly launch[ed]" the International Space Station, creating joint and several liability

⁹¹ Liability Convention, *supra* note 3, at art. V.

⁹² *Id.* at art. I.

⁹³ *Id.*

between them for any harm caused by it on Earth.⁹⁴ Determining the answer to this question, however, is complicated by the fact that the various parts of the International Space Station were not all made by the same states, launched at the same time, or launched from the same place. This would seem to place the International Space Station outside of the definition provided by Article V, which is tied to launching events, not the resulting completed complex satellite.⁹⁵

The International Space Station may also be understood as a collection of individual satellites; as such, joint and several liability would not apply to it as a whole and each individual launching state would remain responsible for each satellite it places in space. This is all well and good, but a practical question immediately comes to the fore: if each of the satellites is amalgamated into the whole, what is the proper regime to use in order to determine the amount of restitution owed to a harmed state by that whole? In the scenario considered by this Section, the amount of harm caused by each individual satellite is likely to be almost impossible to determine.

3. The return of market share liability?

The reader might suppose at this juncture that there *must* be a satisfactory way to apportion liability in the scenario under consideration. The reader might, for example, recall the famous U.S. tort case of *Sindell v. Abbott Laboratories*—but the approach that *Sindell* established is not without significant problems.⁹⁶ Even though the reader might have a gut instinct to apply the *Sindell* method to these circumstances, doing so would more deeply entrench the liability loophole.

The plaintiff in *Sindell* claimed that she was harmed by a drug with dangerous side effects. Even though there was uncertainty about which drug manufacturer was individually responsible for her injury, the drug at issue, DES, was uniform across drug manufacturers.⁹⁷ Moreover, it was certain that the plaintiff had been harmed by such drug product.⁹⁸ The court therefore proposed a novel method of apportioning liability: it ordered each manufacturer of the drug product to pay a share of the plaintiff's damages equal to the amount of their market share in the

⁹⁴ *Id.* at art. V.

⁹⁵ *Id.*

⁹⁶ *Sindell v. Abbott Laboratories*, 26 Cal. 3d 588 (1980). *Sindell* is being examined in this context (and not as a solution to the liability loophole below in Section V) precisely because it does nothing to address the liability loophole problem. However, because *Sindell* is often discussed by academics to support doing away with notions of causation and fault—an objective this Comment is starkly opposed to—the *Sindell* rule will be briefly considered at the point when it is most likely to occur to the reader.

⁹⁷ *Id.* at 611.

⁹⁸ *Id.*

drug at the time the plaintiff purchased the harmful product.⁹⁹ This “market share liability” solution (adapted to the “market” of the mass of the International Space Station), if found to be just and equitable by a claims commission, would fit the terms of the Liability Convention.¹⁰⁰

The *Sindell* case garnered much controversy, however, because it did away with needing to prove “fault and causation as elements” in the case before ascribing liability.¹⁰¹ This lack of due regard for fault and causation is precisely the problem that this Comment perceives in the Liability Convention, so adopting the *Sindell* court’s market share liability would do more harm than good: on the one hand, a reasonable method for attributing liability in complex cases will be established; on the other, fault and causation will continue to be disregarded and the Holmesian bad man will still have no need to worry about legal responsibility.

Even though *Sindell*’s market share liability method of apportioning liability has a small but devoted following in academic literature and is sometimes seen as a potential solution for complex international problems like climate change, *Sindell*’s rule has wisely not been accepted in other countries nor in positive international law.¹⁰² This lack of lasting influence makes it doubtful that market share liability will be adopted by an international claims commission called under the Liability Convention.

In sum, refusing to imitate *Sindell* would leave the particular attribution problem posed by the International Space Station unaddressed, but would more importantly uphold the normal requirements of showing the defendant’s fault and causation as necessary elements before imposing liability. Although some commentators favor adopting a market share liability regime in these circumstances, the market share apportionment scheme is a red herring and merely a band-aid over a deep wound. Market share liability does nothing to close the liability loophole, and may in fact more deeply entrench it. Market share liability should therefore be rejected as a solution and be considered no further.

⁹⁹ *Id.* at 611–12.

¹⁰⁰ This is because Article XII of the Liability Convention instructs that compensation “shall be determined in accordance with international law and the principles of justice and equity” to the extent which “will restore the person [or collective] . . . on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.” Liability Convention, *supra* note 3, at art. XII.

¹⁰¹ Lewis A. Berns & George J. Lykos, *Sindell v. Abbott Labs—“The Heir of the Citadel,”* 15 THE FORUM 1031, 1038 (Summer 1980).

¹⁰² See THE PRACTICE OF SHARED RESPONSIBILITY IN INTERNATIONAL LAW 1047 n.190 (Andre Nollkaemper et al. eds., 2017); see also RODA VERHEYEN, CLIMATE CHANGE DAMAGE AND INTERNATIONAL LAW: PREVENTION DUTIES AND STATE RESPONSIBILITY 293 n.288 (2005).

4. Article VII of the Liability Convention is a phantom menace.

There is an additional complication in the Liability Convention to be considered: the Liability Convention's terms do not apply to damage caused by a launching state's satellite to the launching state itself. Article VII of the Liability Convention commands that the Liability Convention's terms "shall not apply to damage caused by a space object of a launching State to . . . nationals of that launching State."¹⁰³ In other words, the Liability Convention is not activated by an American satellite causing harm to Americans so long as the U.S. is responsible for that satellite under the terms of the Liability Convention. This is true even if the satellite fell due to an intervening act by another state or agent.

This last factor is particularly significant to the hypothetical situation under consideration because the U.S. contributed the lion's share of the International Space Station's components.¹⁰⁴ If the International Space Station is a single satellite belonging to the U.S. by merit of its plurality control, and the satellite falls onto the U.S., the damage would be entirely outside of the reach of the liability regime and the U.S. would go without compensation for any harm suffered. To clarify, considerable damage would likely come from component parts of the International Space Station created and launched by other nations; but the U.S. would not be able to collect compensation from those other nations under the liability regime because it would be the designated responsible launching state under this categorization of the International Space Station.¹⁰⁵ In a similar vein, if the International Space Station is considered to be a collection of individual satellites (a plurality of which are American), a calculation of how much restitution the U.S. would be entitled to in this situation would be immensely difficult.

5. Do, or do not; there is no try.

Complex scenarios like these are where the Liability Convention's terms are most strenuously tested for coherency with their justifying principles and where those terms make least sense. The problems in the regime examined above are not relegated solely to the U.S. or the International Space Station; a similar issue would be presented to any state whose satellite is hijacked or otherwise caused to fall on that state itself. This is to say nothing of the dramatically unjust outcome that the Liability Convention commands by forcing an innocent state to pay when its satellite is used to cause harm to a second state by a third party. As these hypothetical circumstances suggest, the Liability Convention's terms can fail to deter a bad actor and can actually subvert the Liability Convention's own stated

¹⁰³ Liability Convention, *supra* note 3, at art. VII.

¹⁰⁴ *International Space Station Components*, SMITHSONIAN NAT'L AIR & SPACE MUSEUM, <https://perma.cc/4SFT-FV6X>.

¹⁰⁵ Liability Convention, *supra* note 3, at art. VII.

purpose to ensure “prompt payment . . . of a full and equitable measure of compensation to victims of . . . damage” caused by space objects.¹⁰⁶ Consequently, changes to the Liability Convention are necessary in order to allay these concerns and make the Liability Convention effective.

V. PROPOSED SOLUTIONS FOR CLOSING THE LOOPHOLE

Section IV of this Comment demonstrated that the Liability Convention’s terms are not always consistent with its goals. Moreover, under the Liability Convention, legal liability does not flow from agency or control, but instead from ownership. This is in contravention of background principles of state responsibility for acts beyond a state’s control,¹⁰⁷ and could very well provoke new tensions rather than strengthen cooperation or ensure that restitution is paid. It would be eminently more consistent and just to ascribe ultimate liability to whomever is responsible for causing the harm, rather than simply assigning responsibility to the satellite’s launching state for convenience’s sake. Indeed, states party have seemed loath to make use of the current liability regime, and the combination of these problems and developments in the way humans use space that were unanticipated by the Liability Convention’s drafters may well explain why. In order to ensure that the Liability Convention’s goals are achieved in practice, it is necessary to change its mechanics.

This Section explores several potential solutions. First, construing the Liability Convention’s terms to comport with background principles of international law and the analogous customary law of the sea would initially seem attractive. Yet, this requires deliberate blindness towards the totality of the Liability Convention’s text and will leave the harm unaddressed. Second, making use of the awkward language of the Liability Convention’s Article VI to excuse all launching states from harm they did not intend to cause respects state agency, but requires interpretive contortions and again leaves harm uncompensated. Finally, amending the Liability Convention to provide a mechanism that demands contribution from an identified responsible third party would be the best compromise between all of the Liability Convention’s goals. However, amending the Liability Convention will be difficult because doing so requires a majority vote of the states party.¹⁰⁸ Launching states make up only a small minority of the total number of states party, and there is little incentive for non-launching states to accede to a proposed compromise that principally benefits launching states. Moreover, there is no foolproof way to guarantee contribution from a responsible

¹⁰⁶ *Id.* at Preamble.

¹⁰⁷ See *supra* text accompanying notes 5–6.

¹⁰⁸ Liability Convention, *supra* note 3, at art. XXV.

state. Thus, although this Comment's last proposed solution is probably the best one of those considered, its adoption faces considerable obstacles.

A. Interpret the Liability Convention to Conform to Background Principles of State Responsibility

Article XII of the Liability Convention instructs that compensation “shall be determined in accordance with international law and the principles of justice and equity.”¹⁰⁹ As a result of Article XII's command, there is an internal conflict in the Liability Convention: the textual provisions ascribing liability would create results that are almost certainly inequitable. In this context, justice and equity would require at least that innocent parties not bear responsibility for acts which are not their own or within their control.¹¹⁰ If explicitly-accepted international custom or the analogous customary law of the sea applied here, a victim state would not be held responsible for the harm stemming from the theft of the victim state's own ship.¹¹¹ Thus, a claims commission formed under the Liability Convention could reasonably choose not to impose a duty to pay compensation upon a state which more likely than not did not cause the harm motivating the claim.

One benefit of this solution is that the current regime remains textually unaltered—no amendment to the Liability Convention's text is necessary in order to effect this change. An additional benefit is that an innocent state will not necessarily need to pay for harm that it did not cause if the claims commissioners accept this point of view. This would bring the liability regime into accordance with the core tenet of the customary law of the sea that responsibility flows from effective control, not mere ownership. Moreover, this solution would give effect to the principle accepted by the U.N. General Assembly that states are not responsible for acts that were beyond their control.¹¹² As a result, the Liability Convention's consistency with other “international law and the principles of justice and equity” would be maintained.¹¹³

Implementing this solution, however, would essentially nullify the entirety of the Liability Convention. If the chief mechanism of the Liability Convention (holding launching states liable for the harm caused by their satellites) is rendered ineffective, the entire regime falls apart. This proposed solution thus affords due respect for state agency and is consistent with analogous international law, but also has the very bitter side-effect of preventing quick compensation to victims of harm. Additionally, this solution can also only be employed on a case-by-case

¹⁰⁹ *Id.* at art. XII.

¹¹⁰ G.A. Res. 56/83, *supra* note 42, at art. 23; *see also supra* text accompanying notes 5, 6, and 7.

¹¹¹ UNCLOS, *supra* note 6, at art. 101–05.

¹¹² G.A. Res. 56/83, *supra* note 42, at art. 23.

¹¹³ Liability Convention, *supra* note 3, at art. XII.

basis, without any guarantee of consistency in application. This will inevitably prompt concerns over the arbitrariness of particular claims commissions, threatening respect for the regime and its effectiveness. Moreover, this solution effectively predetermines the launching state as the winner, which would deter victim states from bringing claims in the first place, further nullifying the regime.

B. Interpret the Liability Convention to Excuse Launching States from Responsibility When Another State Intended to Cause Harm

Under Article XVIII of the Liability Convention, a claims commission is empowered to “decide the merits of the claim for compensation and determine the amount of compensation payable, if any.”¹¹⁴ As a part of its consideration of merits, the claims commission must interpret the arguments presented by states party against the backdrop of the Liability Convention’s terms. As noted in Section II of this Comment, Article VI of the Liability Convention contains awkward language describing the conditions needed to trigger exoneration from strict liability.¹¹⁵ Of critical importance is the following language of that Article: “exoneration . . . shall be granted to the extent that . . . the damage has resulted . . . from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant state or of . . . persons it represents.” This is supplemented by additional language in the Article which establishes that “no exoneration shall be granted in cases where the damage has resulted from activities conducted by a launching State which are not in conformity with international law.”¹¹⁶ Because this is a command of the Liability Convention, a claims commission will have to consider whether such an act or omission happened in every case.

As a result, there is some leeway for interpretation of the ambiguous language in Article VI. A claims commission may well interpret that Article to include the definition of “on the part of” to mean “experienced by,” thereby exempting launching states from any responsibility for harm which was caused by an act or omission intended to cause damage to the claimant state.¹¹⁷ As the supplementary language above illustrates, however, this exoneration would only apply if the launching state had not violated international law.¹¹⁸ Consequently, if the launching state was the bad actor, it would not enjoy exoneration from liability under this construction. But if the launching state was an innocent victim of

¹¹⁴ *Id.* at art. XVIII.

¹¹⁵ *See id.* at art. VI.

¹¹⁶ *Id.*

¹¹⁷ *See* CAMBRIDGE DICTIONARY, *supra* note 21.

¹¹⁸ Liability Convention, *supra* note 3, at art. VI.

hijacking, it would not bear the burden of being forced to pay for another actor's evil deed.

Akin to this Comment's first proposed solution, this second solution would not require amendment to the Liability Convention. This proposed solution would also have the effect of a blanket exoneration of the launching state from responsibility for harm which it could not control, similar to the first proposed solution. As a result, due respect for a state party's agency in accordance with the general principles of international law will thereby be ensured.¹¹⁹ This interpretation would also maintain consistency with the analogous customary law of the sea: responsibility for harm under would flow from control instead of ownership. Thus, the benefits offered by the first two proposed solutions are effectively identical; they are simply achieved by interpreting different parts of the Liability Convention's text. Similarly, the second proposed solution also suffers from the same flaws as the first. In short, this second solution would similarly leave a gap in coverage that the Liability Convention was specifically designed to prevent: an innocent launching state will not be required to pay, but the victims of harm will not be compensated because there is no mechanism to hold an intervening actor responsible for harm.

Thus, regardless of whether the true perpetrator is identifiable, adoption of either this proposed solution or the first proposed solution would mean that harm would go unaddressed in contravention of the Liability Convention's explicit purpose to ensure that prompt payment is made to victims.¹²⁰ Moreover, both the first and second proposed solutions will either be applied arbitrarily or, if adopted wholesale, will effectively predetermine the launching state as the winner. This will probably disincentivize victim states from bringing claims at all. Finally, without the ability of any state involved to bring a claim before an international claims commission against the true perpetrator, there is a reduced incentive to discover who the perpetrator is.¹²¹

¹¹⁹ G.A. Res. 56/83, *supra* note 42, at art. 23.

¹²⁰ Liability Convention, *supra* note 3, at Preamble.

¹²¹ It should be noted that this Comment chiefly considers the actions of states. If the perpetrator is a private person or organization acting to advance private ends, that person or organization is highly analogous to a pirate. *See supra* text accompanying note 6. Thus, an international claims commission is unnecessary; any state may take action against *hostis humani generis*. If a private actor causes harm while working on behalf of a state, however, the state effectively controls that actor, and they may share joint liability. *See* Alan O. Sykes & Eric A. Posner, *An Economic Analysis of State and Individual Responsibility under International Law* 60–62 (Coase-Sandor Institute for Law and Economics, Working Paper No. 279, 2006).

C. Amend the Liability Convention to Create a Hybrid Regime

As this Comment has explained, there is a contradiction between the Liability Convention's terms and background principles of international law. In addition, there is stark tension within the Liability Convention due to its mutually exclusive goals of ensuring payment to victims via strict liability and of creating effective rules for settling disputes between mutually-consenting parties. A compromise is necessary in order to balance the commands of each of these opposing influences and to make the liability regime workable.

Under Article XXV of the Liability Convention, the Convention's terms may be amended by a majority vote of states party to the Liability Convention.¹²² Article XXVI contemplates that the regime may not be perfect in practice and permits a conference of states party to review the Liability Convention upon a similar majority vote.¹²³

Therefore, an amendment to the Liability Convention with the following broad elements ought to be considered for adoption: First, there may be a presumption of liability upon the harmful satellite's launching state, in accordance with the existing regime. Second, if the satellite's launching state can point to evidence illustrating that it is more likely than not that another state actor or a person whom another state represents is responsible, that evidence will be duly considered by the claims commission when determining the launching state's liability. As part of this consideration, a plan for contribution by the actor at fault should be mandated, as has been proposed in the analogous context of complex aircraft crash litigation.¹²⁴ In this way, the edge of strict liability and winner predetermination is dulled, and incentives to bring claims and to identify the bad actor are created. Because the bad actor may be identified and held legally liable for the harm he causes, some measure of deterrence is also introduced to the liability regime. The liability loophole is thus tightened, even if it cannot be completely closed.

In support of adopting this theory of contribution, joint and several liability is already contemplated within the current regime when two nations jointly launch a satellite.¹²⁵ Contribution is thus a part of the Liability Convention, albeit only between states party and in the aforementioned context. The proposed amendment under consideration would expand contribution to any instance where a launching state can prove by a preponderance of the evidence that it is

¹²² Liability Convention, *supra* note 3, at art. XXV.

¹²³ *Id.* at art. XXVI.

¹²⁴ D. Dudley Oldham & William L. Maynard, *Indemnity and Contribution between Strictly Liable and Negligent Defendants in Major Aircraft Litigation*, 43 J. AIR L. & COM. 245, 270 (1977).

¹²⁵ Liability Convention, *supra* note 3, at art. V.

not responsible for the harm suffered by the claimant state. In other words, the launching state will be presumed liable and ordered to pay compensation, but if it can show that another state was more likely than not to be the true culprit, the launching state can receive a judgment against the bad actor for contribution.¹²⁶ In this way, an innocent state will not be unduly burdened with the bill for harm that it did not cause if it can successfully point to a more culpable actor.

This proposed amendment restores a measure of respect for the principle of state agency without retooling the entire Liability Convention or nullifying its terms. The proposed amendment therefore brings the liability regime closer to consistency with general principles of state responsibility and the law of the sea. Unlike those bodies of customary international law, though, this proposed amendment compromises on the principle of holding states responsible only for what they can control. It does so, however, only to the extent necessary to make the regime workable. Moreover, whereas the first two solutions proposed by this Comment would compromise on the principle of guaranteeing compensation by indemnifying innocent launching states completely, this proposed amendment would ensure that someone pays for the damage in all cases. Consequently, this proposed amendment is best poised to accomplish all of the goals of the Liability Convention while also maintaining more consistency with customary international law than the current liability regime.

D. Potential Objections and Responses

Each of the above solutions has noteworthy weaknesses. Supporters of the present liability regime and others may make cogent arguments against the proposed solutions. These will be considered in turn.

First, one may argue in favor of the present strict liability regime using principles of law and economics. However, this defense of the Liability Convention's current operation is not entirely coherent and does not take the liability regime's lack of success into account.

Second, one may argue against the first two solutions offered by this Comment (jointly termed the interpretive solutions) by arguing that they substitute one of the Liability Convention's mutually exclusive goals for another. Although the interpretive solutions have some benefits, this criticism is a fair one.

Third, a critic may argue against the hybrid regime proposed in Section C by positing that convincing a majority of states party to amend the Liability Convention is too daunting a task. While this seems facially plausible, the fact that compensation will almost certainly not follow under the current regime means

¹²⁶ The preponderance of the evidence standard is used here because it is typically understood to be error-minimizing. See James Brook, *Inevitable Errors: The Preponderance of the Evidence Standard in Civil Litigation*, 18 TULSA L. REV. 79, 108–09 (1982). However, the accuracy of this view has seen ample criticism. See *id.* Whichever method is, in fact, error-minimizing should be adopted.

that an alternative regime with even slightly better odds of compensation could be popular enough to attract a critical mass of supporters.

Fourth, one may point out that the hybrid regime entails very high administrative costs and may not be cost-justified. While the full cost involved in making accurate determinations of fault in these new circumstances is not known, novel methods of securing contribution may nonetheless make the hybrid regime cost-effective—or at least an effective deterrent.

Finally, a skeptic may contend that because the act of de-orbiting a satellite is most likely an act of war, and international instruments like the Liability Convention are of little utility in war, the whole regime is largely pointless. While it is true that conduct in war is bounded largely by custom, creating a regime that at the least may provide marginal deterrence still does something to close the liability loophole.

In sum, no liability regime is immune to criticism. However, of all the solutions considered by this Comment, the hybrid regime proposed in Section C represents the most effective compromise and best ensures that justice will be done. Therefore, it should be the preferred solution to the Liability Convention's current impasse.

1. Strict liability is appropriate because it encourages precaution, reduces dangerous activity levels, and reduces administrative costs.

One might be tempted to counter the line of argument advanced by this Comment by positing that a strict liability regime encourages efficient precautions for satellite owners. However, it is elementary law and economics that strict liability and negligence regimes both have the same effect in that regard.¹²⁷ That is, strict liability and traditional negligence regimes *both* encourage optimal care under ideal conditions.¹²⁸ Strict liability regimes are set apart from standard-based negligence regimes in that they reduce activity levels by imposing liability regardless of the level of care taken.¹²⁹ Therefore, the Liability Convention's current reliance on strict liability fails to advance the practical ground of encouraging efficient precautions any more than an alternative negligence regime would.

Strict liability regimes operate to reduce the level of abnormally dangerous activities by forcing participants in such activities to internalize their externalities regardless of reasonable precautions.¹³⁰ Yet, the externality at issue—harm on

¹²⁷ Kenneth W. Simons, *The Restatement Third of Torts and Traditional Strict Liability: Robust Rationales, Slender Doctrines* 5 (Boston University School of Law, working paper No. 09-15, 2009).

¹²⁸ See Stephen G. Gilles, *Rule-Based Negligence and the Regulation of Activity Levels*, 21 J.L.S. 319, 322 (1992).

¹²⁹ *Id.*

¹³⁰ Simons, *supra* note 127, at 5.

Earth—is not being caused in this situation by the satellite owner; it is instead being brought about by whoever hijacks the satellite. Punishing the satellite owner for misuse of the satellite may at first seem appropriate in order to incentivize better security, but the background principles of international law advise against such a course of action. To analogize, it would be considered absurd and unprincipled to solely blame the owner of a hijacked ship for the harm caused by a thief when that thief deliberately rams it into another boat.¹³¹ Similarly, the owner of a satellite should not be forced to pay for harm caused by its stolen satellite without an opportunity to be compensated in turn.

Moreover, it is unclear that satellites should remain subject to strict liability. Satellites are rapidly becoming a common fixture of modern economies, service anyone with a smartphone or television, and are not highly dangerous to property on Earth under normal conditions. They are thus not precisely typical subjects for strict liability.¹³² That is, satellites are not abnormally dangerous by their nature—like explosive blasting is—and they have become a subject of common use. The strict liability regime thus fails to acknowledge a change in circumstances regarding the ubiquity and social utility of satellites, which brings the suitability of strict liability into question.

However, a critic could still argue that strict liability reduces the administrative costs of the liability regime, thereby streamlining the process and incentivizing settlement through predictability. Without strict liability, the critic would argue, there would need to be a lengthy and costly investigation into the fault of the launching state for the harm caused on Earth. A strict liability regime is comparatively simple and avoids this.

The problem with this view is that the claims commission is not a binding court by default, and so the adjudication of claims is dependent on the faith of the states party in the fairness of that adjudication. Given that states party have been extremely averse to using the Liability Convention, it would seem that their lack of faith is disturbing the operation of the current liability regime. That lack of faith in fairness is probably due to the Liability Convention's strict liability rule, which predetermines winners and losers. Not only does the predetermined loser have no

¹³¹ Indeed, this is precisely the result that the customary law of the sea is poised to avoid. See UNCLOS, *supra* note 6, at art. 101–05; see also Oxford Manual, *supra* note 5, at art. 102.

¹³² Typical subjects for strict liability regimes in American law are those activities which are abnormally dangerous, involve nonreciprocal risks, and are “not a matter of common usage.” Simons, *supra* note 127, at 1, 18. It should be noted that even things under the control of a single party, like gas mains, fall into the category of common usage. *Id.* at 18. There is a strong case that satellite networks are analogous to gas mains and electricity grids and should therefore not be subject to strict liability. However, there has been a controversial move toward accepting strict liability in instances where harm is exclusively caused by one actor, such as in the case of blasting. *Id.* This latter justification for strict liability could apply to satellites, but strict liability still fails to address the underlying problem of perverse incentives considered above.

practical incentive to consent to the claims commission's jurisdiction, the Liability Convention operates in contravention of basic principles of state responsibility, thereby reducing principled grounds to submit as well.¹³³ Moreover, any expenses incurred by the claims commission are "borne equally by the parties, unless otherwise decided by the Commission," so the parties themselves have ample reason to avoid brinkmanship and pursue efficient adjudication.¹³⁴ In sum, the current strict liability regime reduces administration costs, but that benefit is pointless if a binding adjudication is never made.

2. Reinterpreting the Liability Convention is arbitrary and leaves victims of harm without compensation.

Because the first two solutions contemplated by this Comment are not rooted in the intended operation of the Liability Convention, a critic may argue that both are strained interpretive methods aimed at getting to a desired result. In other words, because the solutions nullify the clearly-intended strict liability regime of the Liability Convention, they are arbitrary and illegitimate. A critic could also rightly argue that maintaining absolute respect for the principle of state responsibility, without changing the Liability Convention, requires sacrificing the principle of ensuring compensation for victims of harm.

These points are apt and cannot be easily refuted. As Section A and B illustrate, there are benefits from accepting either interpretive solution. These include the lack of necessity for an amendment and bringing the regime into greater conformity with background principles of international law. However, as those same Sections explain, implementing either interpretive solution would nullify the operation of the Liability Convention. In short, the first and second solutions are not solutions so much as roadblocks for the regime, either of which would prevent orderly resolution of disputes because an innocent launching state would always win and no one else is capable of being haled before the commission. Additionally, without a change in the text and meaning of the Liability Convention, both solutions could only be used by claims commissions on a case-by-case basis, without any assurance of consistency across commissions. This trend will likely culminate in concerns over the arbitrariness of particular claims commissioners, and since one is chosen by each side in a dispute, the deciding vote will be cast by the jointly-chosen commissioner, whose views on this particular subject will become all-important. This would have the expected result of diminishing general faith in the regime's fairness and, consequently, its effectiveness.

¹³³ See G.A. Res. 56/83, *supra* note 42, at art. 23; UNCLOS *supra* note 6, at art. 101–05; *see also* Oxford Manual *supra* note 5, at art. 102.

¹³⁴ Liability Convention, *supra* note 3, at art. XX.

Moreover, both interpretive solutions would create a gap in coverage that the Liability Convention was created in order to address¹³⁵—those harmed by a satellite will go without compensation. If either solution was accepted by a claims commission under the present liability regime, the victims of harm will have no ability to gather compensation for their injuries from an international tribunal. The state representing those victims will consequently be forced to look to diplomacy to redress their injuries, or, if that fails, war. Either solution would defeat the purpose of the Liability Convention in the same way that its terms presently do.

In sum, just as the current liability regime fails to ensure justice because of its arbitrariness, these solutions simply arbitrate in the opposite direction. They do not solve issues so much as create a different—albeit related—problem. For that reason, they should not be preferred solutions to the problems considered by this Comment.

3. The hybrid regime cannot work because amendment is too difficult.

An amendment to create a hybrid regime like the one proposed above is the most consistent and principled solution of those considered. In spite of this, given the small number of launching states in the world and the much larger number of states party to the Liability Convention, it is emphatically in the financial interest of most states party to keep the current regime (which effectively guarantees them compensation as a matter of law) at the expense of those nations that perform most of the launches. This presents a formidable roadblock to an amendment establishing the hybrid regime.

However, if the amended hybrid liability regime is more likely than the current regime to result in compensation to victims of harm, then the amendment would be in the financial interests of all states involved. The amendment could therefore garner enough support to become effective. Illustrating the failures of the current liability regime is not difficult. This Comment has explained that under the current regime, it is eminently unreasonable for launching states to show up to the bargaining table when they are effectively guaranteed to lose. Because any decisions made without launching state consent are merely recommendations, compensation is unlikely to result under the current regime. It is therefore evident that the current regime is unworkable and is in need of amendment.

Consequently, much hinges on whether the amended Liability Convention is sufficiently capable of bringing about more compensation for victim states than the current liability regime. This is difficult to predict without more data about the Liability Convention's operation thus far. However, the amended Liability Convention's possibility of contribution provides launching states with an incentive to cooperate with victim states that they currently lack. For that reason,

¹³⁵ Liability Convention, *supra* note 3, at Preamble.

the amended hybrid liability regime is at least somewhat more likely to result in compensation, and so should be capable of being adopted.

4. The hybrid regime cannot work because its administrative costs are too high.

Determining who is responsible for a cyberattack is often incredibly difficult and time-consuming. Such attacks may take months to analyze enough to reliably demonstrate a particular actor's responsibility.¹³⁶ Building a regime that is dependent on such time-consuming and costly determinations of fault creates a large sum of administration costs that a strict liability regime avoids. Therefore, one might posit, the liability regime should concern itself only with a quick and easy attribution of responsibility and let the other chips fall where they may. In short, it may be better that a state—even an innocent state—foot the bill immediately in order to address the harm suffered by another. The paying state party could then concern itself with identifying the guilty actor if it so chooses and do with that information what it will.

It is true that even though the amended Liability Convention will be more consistent with customary international law, its cost-justification is another matter. Section III of this Comment illustrated that identifying the culprit of a cyberattack is very difficult, but possible. While the length of time needed to identify the source of a cyberattack is typically in the range of months,¹³⁷ data about the costs involved in identifying those who commit acts of cyberwarfare is not widely available. Given the difficulty and length of time involved, it is probable that accurate determinations are, in fact, highly costly. Because states will be averse to taking on the substantial burden of investigation without a promise of compensation for doing so, a formidable obstacle to any definitive identification of cyberattackers still exists for the amended regime, threatening its workability.

Even so, the liability regime may not be dead in the water. A possible, albeit highly controversial, solution to this problem echoes age-old practice regarding pirates. As a matter of custom, pirates are subject to any punishment that a state apprehending them deems appropriate, including seizure of their assets.¹³⁸ Channeling that custom, the victim states may, after identifying the responsible state, seize assets belonging to that responsible state in order to pay compensation to the victims of its aggression. The U.N. may also consider assisting the victim states in identifying the responsible state by paying for the costs of investigation upfront with a promise of later compensation from the value of the seized assets.

¹³⁶ *Thrip: Espionage Group Hits Satellite, Telecoms, and Defense Companions*, SYMANTEC (Jun. 19, 2018), <http://perma.cc/4QBW-QYMH>.

¹³⁷ *Id.*

¹³⁸ UNCLOS, *supra* note 6, at art. 105.

The U.N. Security Council could also authorize the international community to use force to seize the assets of perpetrator states and turn them over to victim states in order to ensure that compensation is paid to victim states.¹³⁹

While this solution entails the use of force and teeters on the edge of international armed conflict, it offers a principled intermediary step between the initial act of aggression and all-out warfare, and for that reason is worthy of consideration. It should be noted at this juncture that treating a state with the legal status of a pirate is unheard of. Even so, when states engage in covert acts of aggression against other states, they are virtually indistinguishable from pirates—if they are not actually entering into a state of war by performing that act. Thus, in the interest of maintaining global security through deterrence, the U.N. would be justified in designating any perpetrator state's assets subject to seizure up to the point necessary to pay for compensation.¹⁴⁰ Although such a solution is highly unorthodox, it is very strongly analogous to the treatment of pirates in customary international law—just on a larger scale.

5. The Liability Convention itself and all of the proposed solutions are impractical.

Finally, a skeptic may argue that each of the proposed solutions—and the liability regime as a whole—are at odds with historical custom regarding restitution for acts of war during armed conflict between states.¹⁴¹ In other words, the Liability Convention could not hope to have any real effect because the most likely scenario for de-orbiting a satellite involves warfare of some kind and states customarily compensate their own citizens once peace is re-established. Moreover, the Cosmos 954 incident illustrates that in the case of an accident, the Liability Convention is unlikely to be followed when the states involved are unfriendly to each other, even if they have established diplomatic channels. The only time the Liability Convention might be workable, the critic would argue, is when the states involved are already friendly and engaged in regular diplomacy. But then the Liability Convention would be largely superfluous, as those states would probably

¹³⁹ U.N. Charter art. 39. All states may attack and apprehend pirates and their property, so long as they do so with vehicles clearly belonging to the government. UNCLOS *supra* note 6, at arts. 100, 107.

¹⁴⁰ If the perpetrator is an individual, there is an even more direct analogue to pirates, and the individual's assets may be similarly seized. U.N. authorization would not be needed to effect the seizure unless the state in which the individual lives refused to permit it, in which case the state could be seen as intentionally facilitating piracy by offering pirates its protection, again raising the question of whether a state can be equivalent to a pirate. UNCLOS, *supra* note 6, at art. 101. However, it is unlikely that an individual pirate will possess sufficient assets to fully compensate victims of the harm they cause. In such a case, the launching state will still foot most of the bill for the damage.

¹⁴¹ See Robinson, *supra* note 79.

come to an agreement without needing to invoke international law. Consequently, the critic would posit, the Liability Convention will not have any strong influence when it is needed most.

In many respects, these contentions are reasonable. Without a textual provision waiving applicability in war, the Liability Convention remains in effect for all damage on Earth caused by space objects in wartime. However, it strains credulity to believe that the Liability Convention's terms will be heeded during armed conflict.¹⁴² Even still, the Liability Convention does not necessarily need to be perfectly effective in wartime to be worthy of adoption.

An effective liability regime may serve as a deterrent to armed conflict in the first place by making it costlier for the aggressor if it loses the war.¹⁴³ To do so, the regime may include authorization for the international community to use force against a bad actor, which would certainly serve as a strong deterrent against using another state's satellites to cause harm. A decision by a claims commission that is adverse to the bad actor could also provide some leverage during peace negotiations. From just these considerations, it is clear that the Liability Convention itself is not entirely without utility in wartime, although it will likely remain a background influence at most. In brief, it could hardly hurt to determine that the bad actor is legally responsible instead of the innocent satellite owner.

VI. CONCLUSION

A suggestion to substantially alter a prominent instrument of international law likely gives the reader pause. However, it must be borne in mind that in spite of being aimed at dispute resolution, the Liability Convention's terms currently create an impractical regime which is in tension with its own professed goals, to say nothing of its inconsistency with customary international law. For these reasons, the Liability Convention has seen only very limited use and no notable success in over four decades of existence. The problems posed by the ongoing rise of cyberwarfare and exponential increase of human activity in space make settled routes for dispute resolution essential—but the Liability Convention cannot serve in that capacity in its current form. Consequently, it rightly deserves consideration for amendment.

¹⁴² The staying power and force of international law concerning conduct in war has long been the subject of contentious debate and doubt, and scholars will often assume *arguendo* that states will comply. See Eric Posner & Alan Sykes, *Optimal War and Jus ad Bellum*, 93 GEO. L.J. 993, 997 (2005). Actual compliance with the Liability Convention during wartime, however, seems eminently unlikely against the backdrop of international norms regarding compensation for acts of war.

¹⁴³ As stated previously, the international norm is that the victor state negotiates compensation for harms suffered from the losing state post-war. Modes of doing so have changed over time, but the general principle remains the same. See Rudolf Dolzer, *The Settlement of War-Related Claims: Does International Law Recognize a Private Victim's Right of Action – Lessons after 1945*, 20 BERKELEY J. INT'L L. 296, 310, 349–51 (2002).

The hybrid regime amendment proposed by this Comment is a more consistent and principled solution than the interpretive contortions required by the first two solutions this Comment proposed. Although in some ancillary respects it is very novel, it is also intermediary in its central function and does not dramatically alter the core mechanics of the Liability Convention itself. That is, a hybrid regime would simply provide an additional process for extracting compensation from the truly responsible party rather than reforming the liability regime whole cloth. There are practical problems with the mechanics of actually getting that contribution, but similar problems of compliance are inherent to international dispute resolution. At the very least, providing appropriate and universal rules for obtaining the contribution—whether peacefully or by authorized seizure—can hardly hurt and will more likely than not deter the Holmesian bad man from causing harm in the first place. For that reason, the hybrid regime is the most preferable and palatable option of all those considered.

As this Comment demonstrates, changes to the Liability Convention's operation are necessary in order to actualize the motivating principles of international law and the liability regime's own stated goals. The solutions proposed above are not perfect, but they do operate to close—or at least tighten—the liability loophole. Every liability regime has trade-offs, but a proper regime will ensure that if harm results on Earth from a space object, it will be compensated to the extent that justice demands. Just as important as ensuring proper compensation, however, is the principle that actors who are most responsible for the damage will similarly be most responsible for compensation, rather than assigning that duty to innocent launching states. The quest for an ideal legal system may strike some as naïve, but as man reaches for the stars, so too must the law.

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.