JOURNAL

OF

SPACE

LAW

VOLUME 39, NUMBER 2

2014

JOURNAL OF SPACE LAW

UNIVERSITY OF MISSISSIPPI SCHOOL OF LAW
A JOURNAL DEVOTED TO SPACE LAW AND THE LEGAL PROBLEMS ARISING OUT OF HUMAN ACTIVITIES IN OUTER SPACE.

VOLUME 39 | 2014 | NUMBER 2

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 Suggested abbreviation: J. SPACE L.
ISSN: 0095-7577

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AEROASSISTED MANEUVERS: POTENTIAL AIR AND SPACE LAW CHALLENGES

Robert A. Bettinger[*] *and Jonathan T. Black*[**]

ABSTRACT

Diverging from the current paradigm that spacecraft exclusively operate within the vacuum of outer space, current engineering efforts are seeking to create spacecraft that can exploit the aerodynamic forces of the upper atmosphere in order to implement a trans-atmospheric, aeroassisted maneuver. By transcending both the airspace and outer space environments, aeroassisted maneuver represent a source of potential air and space law challenges arising due to current ambiguities surrounding atmospheric delimitation debate as well as the question of airspace sovereignty limits vis-à-vis space law.

I. INTRODUCTION

Spacecraft can be divided functionally into two categories: (1) Vehicles that operate exclusively in the vacuum environment of space; and (2) vehicles that are hybrid in nature and capable of re-entering the Earth's atmosphere following the completion of a given on-orbit mission. While the former category is referred to as

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satellites, the latter are identified trans-atmospheric vehicles, or TAVs. Since the 1970s, TAVs have been limited to boost-glider designs, such as the Space Shuttle and X-37B Orbital Test Vehicle (OTV), which achieve orbit as either a secondary or tertiary stage on a rocket-propelled spacelift system. Following re-entry, the TAV then utilizes aerodynamic lift to perform a gliding maneuver in order to land. Seeking to evolve the boost-glider design concept, the early 21st century has witnessed an emergence of both national and corporate efforts to create a hypersonic spaceplane capable of taking off and landing horizontally on a conventional runway.[1] Designed as a single-stage-to-orbit vehicle, the spaceplane is able to attain a level of mission "availability and flexibility of use" hitherto limited by the mass budget, launch window, and launch site location restrictions inherent in existing rocket booster systems.[2]

Whether designed as a boost-glider or spaceplane, TAVs offer the capability of utilizing the upper atmosphere as an alternative maneuver environment rather than an interface solely for the purpose of re-entry at the mission end-of-life for manned and unmanned spacecraft. Traditionally, orbital states and orbit geometry are modified via various maneuvers performed *in vacuo* which, depending on both the initial mission altitude and desired orbital change, have the propensity of becoming prohibitively expensive in terms of propellant expenditure. Alternatively, atmospheric re-entry can be employed as a means of operational maneuver whereby the aerodynamic drag of the upper atmosphere is exploited by a TAV to create a trans-atmospheric, aeroassisted maneuver. Such maneuvers have been analytically demonstrated to achieve a desired orbital change for less propellant than required by a vacuum-only maneuver, thus extending the spacecraft mission life.

II. TYPES OF AEROASSISTED MANEUVERS

Overall, trans-atmospheric maneuvers can be implemented in three fundamental mission contexts: (1) Orbit modification; (2)

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[1] Carl Q. Christol, *The Aerospace Plane: Its Legal and Political Future*, 9 SPACE POL'Y 35, 36 (1993).

[2] Pierre Betin, *Reflections on the Spaceplane*, 7 SPACE POL'Y 137, 138 (1991).

orbital transfer from High Earth Orbit (HEO) to Low Earth Orbit (LEO); and (3) interplanetary exploration. The first mission context occurs primarily in LEO and is comprised of three distinct maneuvers options, each of which are synergetic in execution since they utilize both atmospheric forces, in the form of aerodynamic drag and lift, and propulsive forces. The first type, known as 'aerobang' maneuvers, consists of a trans-atmospheric flight trajectory augmented by continuous thrusting at maximum throttle so as to limit the duration of atmospheric flight, thereby reducing heat effects produced during re-entry. Similarly, the second type of maneuver, known as 'aerocruise,' also utilizes a steady-state propulsive force during the trans-atmospheric trajectory, but at a throttle level sufficient to counteract only aerodynamic drag. The third maneuver type, known as 'aeroglide,' relies primarily on aerodynamic lift and produces a gliding, unpowered trajectory which employs propulsive forces to only enter and exit the trans-atmospheric trajectory.[3]

The second mission context utilizes an 'aerobrake' maneuver whereby the size and eccentricity of an initial orbit are reduced as a result of aerodynamic drag effects engendered by either a single or successive perigee passages through the upper atmosphere. In addition to aerobraking, the third mission context can also utilize maneuvers called 'aerocapture' and 'aerogravity-assist.' For all three maneuver options, an interplanetary trajectory is designed to intersect the upper atmosphere of a target planet in order to reduce spacecraft energy and establish a stable planetary orbit by exploiting atmospheric drag.[4] Presented only for completeness, the maneuvers comprising the interplanetary mission context are not applicable to the Earth-based orbits discussed below.

III. APPLICABILITY OF AIR AND SPACE LAW

Not officially defined by international treaty, the demarcation between airspace and outer space has created an extant legal

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[3] Richard E. Johnson, Effects of Thrust Vector Control on the Performance of the Aerobang Orbital Plane Change Maneuver (1993) (unpublished MS Thesis, Naval Postgraduate School) (on file with Dudley Knox Library), at 3-4.

[4] Christopher L. Darby & Anil V. Rao, *Optimal Impulsive LEO to LEO Multiple-Pass Aeroassisted Orbital Transfer for Small Spacecraft* 3 (20th AAS/AIAA Space Flight Mechanics Meeting, Paper Presentation, 2010).

debate concerning where air law ends and space law begins. As codified in Article I of the Convention on International Civil Aviation, Chicago, 1944, air law grants each state "sovereignty and exclusive territorial jurisdiction" over its' respective airspace, only to be infringed upon by prior formal agreement or treaty.[5] By contrast, Article II of the Outer Space Treaty of 1967 declares outer space to be an international zone outside the realm of state sovereignty.[6] In order to define the transition between air and space law, two differing methods of airspace and outer space delimitation have arisen: spatialism and functionalism. For spatialists, the boundary between air and space is defined physically in terms of altitude, such as the von Kármán Line devised in the 1950s. Rather than an altitude boundary, the functionalist approach seeks to delimit airspace and outer space according to function and "distinctive traits" of the vehicle operating within the environment in question.[7]

Compounding the demarcation debate is the absence of any conventional or customary rule of international law addressing the "innocent passage" of vehicles ascending to or descending from space. While such passages do occur within foreign airspace, "no protests against [them] have been raised so far" and the passages are viewed as a *fait accompli*.[8] When considered within the context of both the demarcation and atmospheric passage debates, aeroassisted maneuvers pose a series of challenges to air and space law alike. Since aeroassisted maneuvers are initiated from and terminate in space, are they governed by air and/or space law? Can such maneuvers be considered an "innocent passage" when implemented within foreign airspace?

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[5] Alexandra Harris & Ray Harris, *The Need for Air Space and Outer Space Demarcation*, 22 SPACE POL'Y 3, 4 (2006); Stephan Hobe et al., *Space Tourism Activities – Emerging Challenges to Air and Space Law?*, 33 J. SPACE L. 359, 361 (2007).

[6] Harris, *supra* note 5, at 4.

[7] *Id.* at 363.

[8] Andrei D. Terekhov, *Passage of Space Objects through Foreign Airspace: International Custom?*, 25 J. OF SPACE L. 1, at 6, 8 (1997).

A. Spatialism and Aeroassisted Maneuver Altitude Delimitation

Whether an aeroassisted maneuver is implemented to modify an existing orbit or conduct an orbital transfer from HEO to LEO, a trajectory must transit the upper atmosphere at an altitude with sufficient density to impart the requisite aerodynamic force on a TAV. Depending on the desired final orbit geometry as well as the imposition of deceleration and heat transfer constraints by the structure and/or payload of sample TAVs, trajectory simulations have indicated that aeroassisted maneuvers have the potential of occurring within the 50-100 kilometer (km) altitude regime.[9]

When viewed within the context of spatialism, the potential altitude regime for aeroassisted maneuvers occurs lower than many international attempts to delimit airspace and outer space. Corresponding to an altitude of 100 km, the von Kármán Line represents an approximate boundary above which an aircraft cannot derive any aerodynamic lift from the atmosphere and must travel at a speed approaching orbital velocity.[10] As an alternative, Italy in 1975 proposed a boundary at 90 km since it represented the median altitude between the upper limit of aircraft flight at 60 km, and the lowest possible satellite orbit at 120 km. In 1976, Belgium echoed the reasoning of von Kármán by advocating a boundary at 100 km, while the Soviet Union in 1979 proposed an arbitrary boundary "at an altitude not exceeding 110 km."[11]

Although the Italian delimitation proposal places the upper altitude limit of aircraft flight at 60 km, this corresponds to the approximate operating altitude of the X-15, an experimental rocket-propelled aircraft of the early 1960s.[12] In terms of conventional

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[9] Christopher L. Darby & Anil V. Rao, *Minimum-Fuel Low-Earth Orbit Aeroassisted Orbital Transfer of Small Spacecraft*, 48 J. SPACECRAFT & ROCKETS 618-628 (2011); Patrick R. Jolley & Stephen A. Whitmore, *Aerodynamic and Propulsion Assisted Maneuvering for Orbital Transfer Vehicles* (5th Responsive Space Conference, Paper Presentation, 2007), at 1-39.

[10] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 167-168 (Ashgate Publishing Limited 2009).

[11] *Id.*, at 169.

[12] W. D. Kay, *The X-15 Hypersonic Flight Research Program: Politics and Permutations at NASA*, *in* FROM ENGINEERING SCIENCE TO BIG SCIENCE: THE NACA AND NASA COLLIER TROPHY RESEARCH PROJECT WINNERS 155 (Pamela E. Mack, ed., U.S. GPO 1998).

aircraft, the upper altitude limit is considerably lower with the U.S. Air Force's U-2 reaching a maximum ceiling of approximately 21 km. As for spacecraft, the lowest operational orbit corresponds to an altitude of 96 km, which is lower than all aforementioned delimitation proposals.[13] By considering both the nominal ceiling of the X-15 and the lowest achieved satellite orbit, an altitude "gap" at 60-96 km is created which aligns with the potential operating environment for aeroassisted maneuvers.

Even though conventional aircraft and lighter-than-air vehicles such as blimps do not operate at 60-96 km, this altitude regime is still considered to be sovereign airspace as evidenced in several reports issued since the 1960s. As one example, the Canadian government identified that the Space Shuttle *Challenger* flew within its airspace at an altitude of approximately 68 km while on glide path to land in the United States following re-entry in 1984.[14] A second example arises from the proceedings of the United Nations' Committee on the Peaceful Uses of Outer Space in 1996.[15] In response to a questionnaire disseminated to member states regarding legal issues associated with "aerospace objects," Germany noted that the Soviet Space Shuttle *Buran* passed through the airspace of Turkey following re-entry in 1988.[16] Based on a similar structural design and mission profile, the *Buran* is assumed to have flown through Turkish airspace at an altitude commensurate with that of the *Challenger*.

Despite the ambiguity surrounding the actual spatial delimitation of airspace and outer space, precedence dictates that airspace sovereignty extends up to and beyond an altitude of 90 km. Consequently, aeroassisted maneuvers occurring at an altitude 50-90 km would be considered a passage through foreign airspace if not implemented over international waters.[17] By implementing

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[13] Katherine M. Gorove, *Delimitation of Outer Space and the Aerospace Object – Where is the Law?*, 28 J. SPACE L. 11, 12 (2000).

[14] Terekhov, *supra* note 8.

[15] For the complete questionnaire, *see* Gorove, *supra* note 13, at 17-18; for the complete member states' responses to the questionnaire, *see also* U.N. Committee on the Peaceful Uses of Outer Space, *Questionnaire on Possible Legal Issues: Replies from Member States*, UN Doc. A/AC.105/635, (Feb. 15, 1996).

[16] UN Doc. A/AC.105/635, *supra* note 15, at 7.

[17] Since aeroassisted maneuvers implemented over international represent benign occurrences, only those maneuvers that infringe on foreign airspace will be considered henceforth.

an aeroassisted maneuver within airspace, a TAV is then subject to the jurisdiction of air law. Since an aeroassisted maneuver places a TAV within foreign airspace for a time of finite duration however, can the passage and airspace infringement be deemed "innocent" and then overlooked by the overflown state as with cases of vehicles ascending to or descending from space? The presumptive answer would be in the affirmative, but a functional analysis of the TAV mission is required in order properly classify an aeroassisted maneuver as an "innocent passage" or not.

B. Functionalism and TAV Classification

According to the functionalist approach, the question of legal jurisdiction is dependent on the function of the vehicle in question. Outlined in the 1975 Convention on Registration of Objects Launched into Outer Space, a launch vehicle and satellite payload are considered "space objects" and therefore governed by space law since they are intended to reach and operate within the space environment.[18] A broad term, "launch vehicle" within the context of the aforementioned Convention applies to rocket boosters and not carrier aircraft. For the latter case, such as the Lockheed L-1011 transport aircraft utilized as an upper atmospheric launching platform for the Pegasus booster rocket, both the carrier aircraft and attached spacecraft are governed by air law until vehicle separation. Following separation, the Pegasus booster and similar spacecraft cannot "derive support in the atmosphere from the reactions of the air" and are thus considered "space objects" subject to space law.[19]

Based on the Convention on Registration, a TAV conducting normal mission operations in orbit is considered a "space object" and is subject to space law. When conducting an aeroassisted maneuver however, the TAV utilizes aerodynamic forces within the upper atmosphere to produce lift. Does this ability to leverage aerodynamic forces during the aeroassisted maneuver necessitate a change in vehicle status from space object to aircraft, and a like-

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[18] Convention on Registration of Objects Launched into Outer Space, *opened for* signature Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

[19] JANE VAN NIMMEN, ET AL., NASA HISTORICAL DATA BOOK, VOLUME VII: NASA LAUNCH SYSTEMS, SPACE TRANSPORTATION, HUMAN SPACEFLIGHT, AND SPACE SCIENCE, 1989-1998 55 (U.S. GPO 1999); Hobe, *supra* note 5, at 364.

wise change in legal jurisdiction from space law to air law? Since the TAV produces lift while transiting the upper atmosphere, then it could be assumed that air law supersedes any space law consideration as with the preceding example of the Pegasus booster attached to the L-1011 carrier aircraft. The validity of this assumption is tenuous, especially when the functions of both the TAV and aeroassisted maneuver are considered. With the former, a TAV is intended to reach and operate within outer space and thus constitutes the baseline definition of a "space object." For the latter, an aeroassisted maneuver is implemented in order to alter the geometry of an orbit, whether originally in LEO or HEO. As a result, the TAV always remains within the space environment except for the duration of the aeroassisted maneuver itself (and the eventual re-entry at mission end-of-life).

If a TAV is subject to air law during an aeroassisted maneuver, then the right of foreign airspace sovereignty must be observed. Consequently, a state whose airspace will be infringed by an aeroassisted maneuver maintains the right to regulate passage within its airspace. Apart from civilian missions such as those related to science or transportation, as with the case of space tourism, TAVs also have the potential of hosting a variety of military functions. From being a platform for augmented command, control, communications, intelligence, surveillance, and reconnaissance (C3ISR), or a vehicle for prompt global strike, TAVs proffer an undeniable enhancement of military capabilities.[20] Based on the their inherent military mission implications, aeroassisted maneuvers could be implemented to either deliver a TAV over a target of interest, or place a TAV within the atmosphere to conduct a specific mission within the airspace of a state being overflown.

In light of these potential missions, a state could follow precedence and impose a "no-fly zone" for aeroassisted maneuvers deemed to fall outside the bounds of an "innocent passage." For example, the French and Spanish governments imposed "no-fly zones" which prevented the passage of U.S. Air Force aircraft through their respective airspaces when executing Operation El

[20] Jinyuan Su, *Near Space as a* Sui Generis *Zone: A Tri-Layer Approach of Delimitation*, 29 SPACE POL'Y 90, 91 (2013).

Dorado Canyon against Libya in 1986.[21] Similarly, a state could impose a "no-fly zone" precluding an aeroassisted maneuver intended to insert a TAV in orbital position to complete a specific military mission, e.g. C3ISR or prompt global strike. When considered under the jurisdiction of air law, aeroassisted maneuvers implemented in violation of a state-imposed "no-fly zone" would therefore constitute a breach of international treaty.

IV. ENVIRONMENTAL CONSIDERATIONS

Occurring within the 50-90 km altitude regime, aeroassisted maneuvers place a TAV not only within potential foreign airspace, but also in the physical environment of the upper atmosphere. Of the various human space activities, space launch produces a high level of exhaust pollutants in the form of dust, the emission of toxic compounds such as aluminum oxide (from solid propellant), and the spraying of unburned liquid propellant like hydrazine. Although argued by many to have a negligible cumulative effect on atmospheric degradation, the burning of rocket propellant – whether solid or liquid in composition – in the upper atmosphere has been demonstrated to deteriorate the ozone layer and chemically contaminate the water cycle.[22] Not chemically destructive, the release of water as an exhaust by-product can interfere with ionospheric conditions, thus disrupting the transmission of wireless communications.[23]

While the aeroglide subtype of aeroassisted maneuver only performs thruster burns in space, the aerobang and aerocruise alternatives produce a steady thrust throughout the trans-atmospheric trajectory. Even though a TAV's propulsion system burns liquid rather than solid propellants and therefore produces fewer pollutants, exhaust by-products are still be continuously injected into the airspace when an aerobang or aerocruise maneuver is implemented. As a result, can a state deny the infringement of its airspace by an aeroassisted maneuver due to environmental considerations? With the aerobang or aerocruise maneuver occur-

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[21] JOSEPH T. STANIK, EL DORADO CANYON: REAGAN'S UNDECLARED WAR WITH QADDAFI 145-146 (Naval Institute Press 2003).

[22] LOTTA VIIKARI, THE ENVIRONMENTAL ELEMENT IN SPACE LAW: ASSESSING THE PRESENT AND CHARTING THE FUTURE 29-31 (Koninkliijke Brill NV 2008).

[23] *Id.* at 31.

ring within the jurisdiction of air law, does the operator of the TAV assume sole liability for any environmental impact of the maneuver?

V. CONCLUSION

The continued engineering development of TAVs will undoubtedly require the air and space law challenges of aeroassisted maneuvers to be formally addressed due to ongoing debate associated with the prospect of airspace and outer space delimitation. Occurring within the 50-90 km altitude regime, spatialism dictates that TAVs implementing an aeroassisted maneuver are subject to air law. From the functionalist perspective however, the legal delimitation of air and space law becomes ambiguous with arguments that can identify a TAV as either an aircraft or space object. For many states, to include the Lebanon, the Syrian Arab Republic, and Turkey, the stance is clear: A TAV traversing foreign airspace during an aeroassisted maneuver is subject to air law. For states like the Czech Republic however, ambiguity resurfaces with the view that air law only applies to "objects resembling [spaceplanes], but not to objects resembling Space Shuttles."[24]

Due to the unique hybrid characteristics of not only aeroassisted maneuvers, but also TAVs, one viable solution option is to spatially establish an exclusive zone of operation for TAVs between the maximum operating ceiling of conventional aircraft and the lowest achievable orbit for satellites. Defined as a "*sui generis* zone," the approximate altitude regime of 21-96 km would permit the freedom of operation of TAVs (within peaceful bounds) and officially delimit the boundaries of both airspace sovereignty and outer space.[25] A propitious compromise, such an exclusive zone for TAVs could forestall the onset of legal challenges for nascent commercial and national ventures seeking to implement aeroassisted maneuvers.

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[24] Gorove, *supra* note 13, at 21-22.
[25] Su, *supra* note 20, at 92.

SPACE: THE FOULED FRONTIER

ADJUDICATING SPACE DEBRIS AS AN INTERNATIONAL ENVIRONMENTAL NUISANCE

Barry Kellman[*]

In Pixar's dystopian vision of 2805, WALL-E, a sentient refuse-collecting robot lives in a trashed and lifeless landscape. One day, he sets eyes on EVE, an extraterrestrial vegetation evaluator sent to determine if Earth can sustain life. When EVE returns to space in her rocket ship, love-struck WALL-E clings to it, desperately holding on to go with her and find out what exists in the great beyond. But soon the rocket confronts turbulence. WALL-E sees that Earth is surrounded by junk, metal, satellites, pieces of rubble; the rocket has to bore through. At last, the rocket ship bursts out from the mass of orbiting trash, and WALL-E glimpses stars and the infinity of space for the first time.

Eight centuries earlier, the International Court of Justice (ICJ) pronounced:

> [T]he environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn. The existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other

---

[*] Professor of Law and Director of the International Weapons Control Center, DePaul University College of Law; Fulbright 2014 Distinguished Professor, Lund University, Sweden. The substance of this paper was initially presented at a workshop convened by the European Space Policy Institute (ESPI), *The Relevance of General International Law for Debris Questions*, 11 April, 2013, *available at* http://www.youtube.com/watch?v=Lr54eilSZGI. The author would like to extend appreciation to Professor David Koplow of Georgetown University Law Center for his incisive and often amusing comments. The author is very grateful for the research assistance of Michael Hornback, DePaul College of Law, Class of 2014.

> States or of areas beyond national control is now part of the corpus of international law relating to the environment.[1]

Only if the ICJ's words have legal force and effect will WALL-E's dystopia be merely a cartoonish warning. As of this writing, these words' legal force and effect cannot be taken for granted. Enforcing international law to prevent despoliation of space is our generation's responsibility.

INTRODUCTION

Over 1,100 active satellites operated by over 60 countries and government consortia[2] provide substantial economic, social, and scientific benefit to humanity.[3] However, human use of space is threatened by the increasing density of debris left by dead satellites and spent rocket stages and, more recently, via deliberate destruction by anti-satellite (ASAT) weapons. In time, the quantity of debris will be self-sustaining as debris-on-debris collisions increase the amount of debris until little space is left for the space systems that benefit us all.

Space debris should be among the easiest challenges for international law to resolve through multilateral cooperation.[4] All

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[1] *Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion*, 1996 I.C.J. 226, 241-42, ¶ 29 (July 8).

[2] As of Oct. 5, 2011, Russia (including the Soviet Union and CIS) had deployed the most satellites since the dawn of the space age, with 1412 edging out the US which had 1154. By contrast, the European Space Agency had only launched 39. John Burn-Murdoch, *Second Russian satellite set to re-enter Earth's atmosphere*, THE GUARDIAN, Jan. 17, 2012, *available at* http://www.theguardian.com/news/datablog/2012/jan/17/nasa-space-debris.

[3] Henry R. Hertzfeld & Ray A. Williamson, *The Social and Economic Impact of Earth Observing Satellites*, *in* SOCIETAL IMPACT OF SPACE FLIGHT, 237-64 (2007), *available at* http://history.nasa.gov/sp4801-chapter13.pdf.

[4] *See generally*, Nancy Gallagher, *Space Governance and International Cooperation*, 8 ASTROPOLITICS 2-3 (2010), http://dx.doi.org/10.1080/14777622.2010.524131. Among the more recent calls for diplomatic initiative, the Secure World Foundation (SWF) has endorsed international cooperation, discussion and agreement designed to ensure that outer space is safe, secure and peaceful. Space Sustainability: A Practical Guide, Secure World Foundation, http://swfound.org/media/100822/SWF_Space_Sustainability_booklet_updated_2012_web.pdf (2012) [hereinafter Space Sustainability]. Notably, the SWF's recommendations closely parallel the recommendations of Theresa Hitchens, then-Director of the Space Security Project of the Center for Defense Information, in the UNIDIR Conference Report, *Safeguarding Space for All: Security and Peaceful Uses*, Ch. 5, *in* SPACE DEBRIS: NEXT STEPS (2004).

spacefaring nations have an interest in establishing standards for minimizing the creation of more space debris. International organizations have developed standards (albeit not legally binding)[5] which set parameters of behavior that could become treaty obligations.[6] There is widespread commitment by prominent leaders to address the sustainability of space through the pursuit of shared objectives. Consider the words of Secretary Clinton in 2012, addressing the dangers to space systems which could disrupt critical worldwide services and endorsing pursuit of an "International Code of Conduct for Outer Space Activities."[7]

> [W]e must work with the community of spacefaring nations to preserve the space environment for all nations and future generations.... An International Code of Conduct, if adopted, would establish guidelines for responsible behavior to reduce the hazards of debris-generating events and increase the transparency of operations in space to avoid the danger of collisions."[8]

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[5] The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) has issued nonbinding guidelines relating to space debris that recommend limiting the creation of debris during space missions, limiting explosions and breakups that contribute to debris, and moving defunct satellites to disposal orbits. *See* http://www.un.org/en/events/tenstories/08/spacedebris.shtml.

[6] International Organization for Standardization (ISO) SC13 deals with space data and information transfer and SC14 which deals with Space Systems and Operations. *See* Frederick A. Slane, Presentation to the UN COPUOS STSC LTSSA Workshop, *ISP Space Standards* (2013), *available at* http://www.oosa.unvienna.org/pdf/pres/stsc2013/2013lts-02E.pdf.

[7] *See* Edgar M. Hollandsworth III, *The Space Debris Crisis: Time for an International Treaty*, *available at* http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA553047 [hereinafter Hollandsworth]; and Alexander G. Davis, *Space Commercialization: The Need to Immediately Renegotiate Treaties Implicating International Environmental Law*, 3 SAN DIEGO J. CLIMATE & ENERGY L. 363 (2011-12); Mary Button, *Cleaning Up Space: The Madrid Protocol to the Antarctic Treaty as a Model for Regulating Orbital Debris*, 37 WM. & MARY ENVTL. L. & POL'Y Rev. 539 (2013); Natalie Pusey, *Case for Preserving Nothing: The Need for a Global Response to the Space Debris Problem,* 21 COLO. J. INT'L ENVTL. L. & POL'Y 425 (2010).

[8] U.S. Dep't of State Press Release, An International Code of Conduct for Outer Space Activities: Strengthening Long-Term Sustainability, Stability, Safety, and Security in Space (Jan. 17, 2012), *available at* http://www.state.gov/documents/organization/181208.pdf. The proposed international code of conduct would likely be based on the EU draft Code of Conduct for outer space activities which seeks to minimize harmful debris, requiring all member states to "actively contribute to the promotion and strengthening of international cooperation relating to the activities in the exploration and use of outer space for peaceful purposes." *See generally,* John R. Crook,

This article applauds these sentiments and the diligent work of NGOs, scientists and other public servants to sustain humanity's safe and peaceful use of outer space and curtail space debris. The diplomatic process should certainly be wished well. Any productive diplomatic initiative to address the problem of space debris would be a welcome legacy to bequeath to succeeding generations.[9]

The prospects for substantial progress, however, are not bright. For all of the efforts of the United Nations, the European Union, the United States and many others, little evidence exists of an actual diplomatic process that would significantly address the problem of space debris.[10] Even Secretary Clinton's willingness to negotiate non-binding standards received derision from American neo-conservatives.[11] Any spacefaring State could see itself unjustly hit with the brunt of responsibility or could raise objections based on parochial self-interests. Even if no dissent is registered, a binding set of space standards would apply predominantly to

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United States to Join Negotiations on International Code of Conduct for Space Activities, 106 A.J.I.L. 372 (2012).

[9] For recent expert commentary on the need for new space treaty law, see Hollandsworth, *supra* note 7; Space Security 2011 (Cesar Janamillo ed., 2011) *available at* www.spacesecurity.org; P.J. Blount, *Renovating Space: The Future of International Space Law,* 40 DENV. J. INT'L L. & POL'Y 515 (2012); Brian Beck, *The Next, Small, Step for Mankind: Fixing The Inadequacies of the International Space Law Treaty Regime to Accommodate the Modern Space Flight Industry*, 19 ALB. L.J. SCI. AND TECH. 1, 9 (2009); Elise E. Crow, *Waste Management in Space: Addressing the Challenge of Orbital Debris*, 18 SW. J. INT'L L. 707 (2012); Blake Gilson, *Defending Your Client's Property Rights in Space: A Practical Guide for the Lunar Litigator*, 80 FORDHAM L. REV. 1367 (2011); Dimitris J. Kranious, *Extraterrestrial Ch. 11—Space Regimes and Macroprojects*, in SPACE: INFRASTRUCTURES, TECHNOLOGIES, AND APPLICATIONS, (Information Science Reference) (2008); Jared B. Taylor, *A Market Mechanism Solution to the Space Debris Problem*, 50 COLUM. J. TRANSNAT'L L. 253 (2011-12).

[10] Experts have debated whether such nonbinding space agreements might become binding norms of customary international law. *See generally* Brian Wessel, *The Rule of Law in Outer Space: The Effects of Treaties and Nonbinding Agreements in Space Law*, 35 HASTINGS INT'L & COMP. L. REV. 289 (2012).

[11] John Bolton and John Yoo alleged that the initiative would "trade American Security" and "impede advances in space technology." Most important, the United States might have difficulty "developing antiballistic missile systems in space, testing antisatellite weapons[,] and gathering intelligence." They added, debris-mitigation standards would limit not just "military activities in space," but "some peaceful dual-use technologies, like the multistage rockets used to launch commercial satellites," as well. See Jameson Rohrer, *Deciphering and Defending The European Union's Non-Binding Code of Conduct for Outer Space Activities, IV. Scope and Evolution of the Proposed Code of Conduct,* 23 DUKE J. COMP. & INT'L L. 187 (2012).

future launches, leaving the task of cleaning up the existing mess in space.[12] Altogether, the likelihood of a negotiated solution to the space debris problem does not inspire confidence. Since Secretary Clinton's statement, the problem of space debris has only gotten worse and shows every sign of continuing to do so.

It would be unfortunate if international lawyers compelled too exclusive focus on negotiated mechanisms as the only legal way to address space debris. If a legally binding treaty or other negotiated mechanism is the only way to address space debris, then it may be argued that, absent any negotiated mechanism, no one may be held legally responsible. Observers of space law are too familiar with assertions that, absent negotiated commitments finalized into a binding international accord, there can be no legal responsibility for what happens in space.[13] Buttressed by a bloated notion of State sovereignty,[14] the logic is that until a treaty about space debris stipulates obligations to which burdened parties have consented, States are unaccountable for creating debris in outer space. Noted legal commentators dangerously talk of a lacuna in space law where responsibility does not lie.[15]

The vastness of space itself reinforces a perception that no nation's individual contribution could be directly linked with despoliation of an area so immense. Like many polluters before them, the contributors of space debris have not sought to create harm; they have only sought to deny their responsibility for harm.

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[12] *See generally*, Noah Sachs, *Beyond the Liability Wall: Strengthening Tort Remedies in International Environmental Law*, 55 UCLA L. REV. 837 (2008) for a discussion of why treaty-based regimes for holding States responsible for environmental damage have produced meager accomplishments.

[13] S*ee* Li Juqian, *Legality and Legitimacy: China's ASAT Test*, 5 CHINA SECURITY 43 (2009). For a somewhat broader perspective on this point, see Gennady M. Danilenko, *Outer Space and the Multilateral Treaty-Making Process*, 4 HIGH TECH. L.J. 217, 218-24 (1990).

[14] The argument typically rests on the illogical application of a clause from the *Lotus* case that that which is not prohibited by international law is allowed. For an incisive critique of the consequences of this argument, *see* Peter Hulsroj, *Three Sources – No River, A Hard Look at the Sources of Public International Law with Particular Emphasis on Custom and "General Principles of Law"*, 54 ZEITSCHRIFT FÜR ÖFFENTLICHES RECHT 219 (1999). *More generally, see* Barry Kellman, *Of Guns and Grotius*, J. NAT'L SEC. L. & POL'Y (forthcoming 2014).

[15] *See* Michel Bourbonniere, *National Security Law in Outer Space: The Interface of Exploration and Security*, 70 J. AIR L. & COM. 3 (2005). See also Jackson Nyamuya Maogoto & Steven Freeland, *Space Weaponization and the United Nations Charter Regime on Force: A Thick Legal Fog or a Receding Mist?*, 41 INT'L LAW 1091 (2007).

Since mankind first mastered space flight some six decades ago, responsibility denied has meant spoiled space.

These denials of culpability serve notice that relentless advocacy of treaties in the face of obvious diplomatic inertia might not be tactically optimal. Of course, the same States that balk at being held accountable for space debris absent a treaty have enough power to frustrate progress in dealing with space debris by protracting, interfering with, or ultimately refusing to participate in a treaty regime. Leaving the legal solution to space debris to the pursuit of consensus by the culpable parties is a prescription for more space debris.

This article asserts that space debris is an international legal matter for judicial resolution. Specifically, the United Nations General Assembly on behalf of humanity should seek an International Court of Justice (ICJ) adjudication of States' responsibility for the space debris condition.[16] With regard to space debris, all of us are jointly exposed to current or threatened harm from activities that cross national boundaries, and we share a common interest in controlling those activities.[17] The United Nations General Assembly clearly has standing to represent all our common interest. Legal action should be initiated against all States that have contributed to space debris for having created a global nuisance as to which all spacefaring nations bear common but differentiated responsibilities.

An ICJ ruling could positively reshape the international approach to dealing with space debris by defining States' obligations for remedying the problem of space debris, helping to develop

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[16] ("[T]he General Assembly of the Security Council may request the International Court of Justice to give an advisory opinion on any legal question."). U.N. Charter art. 96. The ICJ has never denied rendering its opinion when so requested by the General Assembly. See Aaron Korman & Giselle Barcia, *Rethinking Climate Change: Towards an International Court of Justice Advisory Opinion*, 37 YALE J. OF INT'L LAW ONLINE 35 (2012).

[17] *See* MICHAEL R. MASON THE NEW ACCOUNTABILITY: ENVIRONMENTAL RESPONSIBILITY ACROSS BORDERS, at *Introduction,* at 3 (Earthscan. London, UK, 2005), *available at* http://eprints.lse.ac.uk/archive/00000578 [hereinafter MASON]: "[C]ontemporary societies across the globe are united in their exposure to (largely unintended) physical threats arising from the far-reaching transformation of material environments and organisms by industrial technologies. [T]hese threats are not only unprecedented in their worldwide scope, they also present novel dangers due to the uncertainties of manufactured environmental change."

norms of behavior to regulate harm to commons areas, and clarifying the legal bases for pursuing effective remedies. The ICJ is well-situated to provide an authoritative statement on principles of general international law as they apply to space debris.[18]

This article is a brief on behalf of humanity as complainant. Part I presents the facts of space debris: the importance of space, and the condition and consequences of space debris. Part II presents the legal argument: outer space is a resource for the benefit of all humanity, and space debris is an environmental nuisance in violation of two principles of international law—the right of free transit and the principle of responsibility for transboundary harm. These principles are complementary and define an obligation of common responsible use of space on behalf of humanity. Part III frames remedies by the polluter-pays principle and by the objective of remediation, not punishment. The ICJ's ruling should, therefore, propound: (1) the illegality of deliberate creation of debris; (2) an obligation to satisfy prevailing standards for preventing debris from space activities; and (3) an obligation to contribute to debris remediation, allocated commonly to each spacefaring State but differentiated by a State's intentions in creating space debris and by its acceptance of responsibility for remediating space debris.

I. SPACE DEBRIS' UNBOUNDED DANGERS

This section contends that the dangers of space debris are serious and that the condition is worsening with graver implications for humankind. It is an easy contention to make. Indeed, there is little dispute among experts about the space debris condition.

A. Necessity and Opportunities of Space

Humanity uses space to sustain modern life. Satellites are essential for communication, weather prediction, disaster recovery, navigation, material sciences, energy, agriculture, water distribution, national military and clandestine services, and envi-

[18] *See How the Court Works*, International Court of Justice, http://www.icj-cij.org/court/index.php?p1=1&p2=6#advisory.

ronmental preservation. [19] In countries that lack physically wired communications lines, a combination of wireless and satellite-based networks connect people. Disaster recovery relies heavily on satellite technology; Earth observation satellites provided invaluable information for coordinating relief efforts following the 2010 Haiti earthquake.[20] Moreover, "[I]nvestment in technology yields spinoffs that have saved tens of thousands of lives, created tens of thousands of jobs, reduced billions of dollars in costs, and generated billions of dollars in revenue."[21] Perhaps the most ubiquitous of these technologies is the Global Positioning System (GPS).[22]

Space exploration, albeit still in its infancy, offers promising future endeavors. With a 6.7% growth rate in 2012, the space industry has grown to over $300 billion in government spending and commercial revenue.[23] Private companies have already invested heavily into space tourism and asteroid mining[24] as well as hu-

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[19] According to NASA, satellites provide data for understanding climate variability and change, improving weather forecasting and warning, supporting sustainable agriculture, improving energy and water resource management, the monitoring an conserving of biodiversity, improved management of terrestrial and marine ecosystems and resources, reducing the loss of life from natural disasters, and provide for a better understanding of environmental factors affecting human health. *The Public Use and Benefits of U.S. Space Capabilities*, U.S. State Department, presented at the 2010 International Space University Symposium (http://www.isunet.edu/previous-symposia).

[20] The Landsat Program, NASA, http://landsat.gsfc.nasa.gov/news/news-archive/dyk_0015.html.

[21] Lisa Rademakers *et al.*, *Spinoff 2012*, National Aeronautics and Space Admin., Office of the Chief Technologist (2012), *available at* http://spinoff.nasa.gov /Spinoff2012/pdf/Spinoff2012.pdf.

[22] The use of this data has since spawned creative new applications by non-governmental groups and others. *The Public Use and Benefits of U.S. Space Capabilities*, U.S. State Department, presented at the 2010 International Space University Symposium, *available at* http://www.isunet.edu/previous-symposia.

[23] *Space Foundation's 2013 Report Reveals 6.7% Growth in Global Space Economy in 2012*, http://www.spacefoundation.org/media/space-watch/space-foundations-2013-report-reveals-67-percent-growth-global-space-economy-2012 (Apr. 2, 2013).

[24] Elon Musk, cofounder of PayPal and Tesla Motors, also founded SpaceX, a private space launch company. Richard Branson of Virgin Group has started the space tourism company Virgin Galactic. Robert Bigelow of Budget suits of America and founder of Bigelow Aerospace, is currently testing inflatable space habitats. Paul Allen, co-founder of Microsoft also founded Stratolaunch Systems in 2011. *See* Jason Paur, *Private Space Industry Races to Fill Job Openings*, WIRED (Feb. 27, 2012, 8:30 AM), http://www.wired.com/autopia/2012/02/private-space-races-to-fill-job-openings/. *See also* Barry Kellman, *On Commercial Mining of Minerals in Outer Space – A Rejoinder to Dr. Ricky J. Lee*, 39 AIR & SPACE L. 413 (2014).

manitarian objectives.[25] Moreover, technologies created for space industries have spinoff terrestrial applications that are increasingly vital to economic growth.[26]

Space's immeasurably vaster value comes from the benefits that space exploration bestows on humanity. Consider, for example, the vision of the Group on Earth Observation (GEO) which operates the Global Earth Observation System of Systems (GEOSS): "a future wherein decisions and actions for benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information." [27] Nine Social Benefit Areas are targeted in which information from GEOSS would be used to make the best decisions: disasters, health, energy, climate, water, weather, ecosystems, agriculture, and biodiversity. The goal of GEOSS is to provide reliable, accurate, easy to access, cross platform data to decision makers. Earth observation satellites are the center of the data pipeline. No other technology offers comparable area coverage and detail.[28]

Not to be ignored is the value of space in humanity's imagination from our species' infancy to the modern era. Some observ-

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[25] For example, a privately launched satellite constellation promises to bring the internet to populations that live in areas that lack the traditional infrastructure for internet access. David Cardinal, *O3b Launches High-Speed Satellite Internet for the Under-Connected*, EXTREMETECH (June 26, 2013), http://www.extremetech.com /extreme/159626-o3b-launches-high-speed-satellite-internet-for-the-under-connected. Project Over 3 Billion is a planned constellation of 12 Medium Earth Orbit (MEO) satellites that will provide coverage as far North as Southern Europe, and as far South to include all of Austria. Entrepreneur Greg Wyler obtained over $13 billion of capital investments from Google and other venture capitalist.

[26] NAT'L AERONAUTICS & SPACE ADMIN. OFFICE OF THE CHIEF TECHNOLOGIST, SPINOFF (2012), *available at* http://spinoff.nasa.gov/Spinoff2012/pdf/Spinoff2012.pdf.

[27] Through their ten year, Global Earth Observation System of Systems (GEOSS), the Group has identified Benefits of this project would be to "reduce loss of life and property from natural or human disasters, understanding environmental factors affecting humans, improving the management of energy resources,…, improving water resources management…, supporting sustainable agriculture and combating desertification, and understanding, monitoring and conserving biodiversity." *GEO and GEOSS: The Group on Earth Observations and the Global Earth Observations System*, Earthzine (2007), http://www.earthzine.org/geo-and-geoss-the-group-on-earth-observations-and-the-global-earth-observations-system-of-systems/.

[28] According to Barbara J. Ryan, Secretariat Director of Group on Earth Observations, "the economic value is not in EO data itself, but in what one does with the data downstream." Barbara J. Ryan, *The Economic Value of EO Data is in its Utility*, GEOSPATIAL WORLD (Jan. 2013), *available at* http://www.geospatialworld .net/Magazine/MArticleView.aspx?aid=30440.

ers believe that humanity will need space "because Earth isn't going to be a safe place in the long term."[29] How long Earth remains habitable is a question far beyond this article's scope, but suffice it to say that we are at ". . . the early stages of the migration of our species away from Earth . . ."[30]

B. The Space Debris Condition

Space debris includes any man-made object in space that serves no useful purpose.[31] The term includes "non-functional spacecraft, examples of orbital debris include unused fuel and dead batteries from satellite break-ups, paint flakes, rocket bodies, and mission-related debris (including human refuse)." According to NASA:

> Orbital debris is herein defined as any man-made Earth-orbiting object which is non-functional, with no reasonable expectation of assuming or resuming its intended function or any other function for which it is or can be expected to be authorized, including fragments and parts thereof. Orbital debris includes non-operational spacecraft, spent rocket bodies, material released during planned space operations, and fragments generated by satellite and upper stage break-up due to explosions and collisions.[32]

More pointedly, space debris is a legacy of garbage that our era is bequeathing to innocent inheritors who will be forced to pay the consequences, and the consequences will be substantial. In less than six decades since Sputnik, more than 21,000 pieces of

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[29] Annalee Newitz, *Escape Plans*, SLATE (May 15, 2013 12:07 PM), http://www.slate.com/articles/health_and_science/science/2013/05/surviving_the_next_mass_extinction_humans_will_need_to_leave_earth_for_space.html. This article is in reference to her newly published novel, *Scatter, Adapt, and Remember: How Humans Will Survive a Mass Extinction* (2013), emphasizing the need for continual space explorations.

[30] Cameron M. Smith, *How Humans Will Evolve on Multigenerational Space Exploration Mission*, SCIENTIFIC AMERICAN (Jan. 11, 2013), *available at* http://www.scientificamerican.com/article.cfm?id=how-humans-will-evolve-multi-generational-space-exploration-missions.

[31] *See generally*, JPL Infographics, *Waste in Space*, *available at* http://www.jpl.nasa.gov/infographics/infographic.view.php?id=10929.

[32] International Academy of Astronautics, Committee on Safety, Rescue and Quality, presented at the World Space Congress in Washington (Aug. 1992).

debris greater than 10cm and more than 100 million particles smaller than 1cm have been put into space. Prior to 2007, the majority of all space debris was due to breakups of upper stages of launch vehicles that remained in space. In recent years, according to NASA, deliberate explosions account for much of the debris now in space.[33] Quantification of debris is difficult because much of it is extremely small; current estimates of *microparticulate* population are between ten billion and one quadrillion pieces.[34]

The especially harmful characteristic of space debris is that it is self-generating. Scientists refer to this as the cascade effect. When orbital debris collides with other space objects, the result is more debris. Eventually, there are chain reactions of collisions that could potentially close some of the most valuable orbits. "According to the cascade effect hypothesis, even if humans add no additional debris to the Earth's orbit, the amount of orbital debris could still grow exponentially, based on the amount that already exists."[35] According to Dr. Kessler, author of the "Kessler Syndrome" which posits that continued space use will lead to a critical mass of debris density,[36] nearly the entire Lower Earth Orbit

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[33] NASA Orbital Debris, *Orbital Debris Frequently Asked Questions,* http://orbitaldebris.jsc.nasa.gov/faqs.html (last visited Sept. 9, 2014) [hereinafter NASA Orbital Debris FAQs].

[34] Space Sustainability, *supra* note 4. The chart at page 17 displays a summary of all objects equal to or larger than 10 cm in Earth orbit officially catalogued by the U.S. Space Surveillance Network. "Fragmentation debris" includes satellite breakup debris and anomalous event debris, while "mission-related debris" includes objects dispensed, separated or released as a part of a planned mission. Many more objects are tracked but only those that can be attributed to a specific launch and launching state(s) are catalogued.

[35] Agatha Akers, *To Infinity and Beyond: Orbital Space Debris and How to Clean It Up*, 33 U. LA VERNE L. REV. 285, 294 (2012) [hereinafter Akers].

[36] The Kessler Syndrome of cascading space debris may be simply viewed as similar to a nuclear reaction. In a nuclear reaction, a single subatomic particle collides with an atom of fissionable ore. The collision splits the atom, sending more subatomic particles into more atoms of fissionable ore. The closer the atoms are packed together, the more likely this chain reaction will continue and sustain itself. If the atoms are too far apart, the reaction will fizzle out. Similarly, the cascading effect in Kessler's theory is dependent on the density of debris in space, impacting other objects in space with enough force to cause more debris. With each such collision between objects in space, the number of projectiles hurling through space increases, hence increasing the quantity of threats to functioning satellites. According to this theory, collisions in space will lead to an ever more densely populated LEO until a critical mass is reached and LEO can no longer sustain an environment safe for satellites and space travel to higher orbits. Donald J. Kessler, *The Kessler Syndrome: Implications to Future Space opera-*

(LEO)[37] is already unstable, and the most densely crowded area for satellites has already reached "runaway" status.[38] Kessler's most recent paper concludes that what was predicted over thirty years ago has now arrived.[39]

This concern is not merely hypothetical. While collisions before 2007 were rare,[40] there is amassing evidence of a worsening situation. On February 10, 2009, two communications satellites, one active (American) and one inactive (Russian), collided accidently about 800 km above Earth. Nearly 2,000 parts (10 cm. or larger) of the two satellites—chunks of metal, foil and plastic—now circle Earth in spreading orbits. While the collision might have been predicted, it is unclear whether or not it could have been avoided.[41] Just a month later, in March 2009, a chunk of debris left from an U.S. rocket launched almost two decades before just missed the International Space Station (ISS), forcing the crew to shelter in a Russian escape capsule.[42] Near misses are also in-

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tions, AMERICAN ASTRONAUTICAL SOCIETY, 2 (Feb 2010), *available at* http://webpages.charter.net/dkessler/files/Kessler%20Syndrome-AAS%20Paper.pdf [hereinafter Kessler].

[37] ("LEO", 160km – 2000km in altitude) LEO is the location of various types of satellites, particularly remote sensing satellites (proximity provides better image resolution than higher orbits), and mobile-satellite phone services (proximity provides for a decreased signal travel delay). The low altitude of these satellites substantially reduces costs making them preferable for most commercial uses. Moreover, LEOs are not constrained to fixed positions above the equator nor are they affected with the substantial lag associated with communications over GEO satellites. LEO, therefore, is the home to most satellites (and most debris). 19 FCC Rcd 11567, 11569 , 19 FCC Rcd 11567 LEO is also the area in which payloads separate from their boosters to continue onto GEO. For these reasons, LEO is much more densely populated than the rest of space.

[38] Kessler, *supra* note 36, at 10. (All regions between 600km and 1700km are unstable). ("Runaway" environment is characterized by the number of fragments increasing to infinity for as long as the intact population remains constant, particularly altitudes between 900km and 1400km).

[39] *Id.* at 14.

[40] In 1996, the French satellite Cerise collided with a debris fragment. *See* Tony Reichhardt, *Satellite Smashers*, AIR & SPACE MAGAZINE (March 2008), *available at* http://www.airspacemag.com/space-exploration/space_debris.html.

[41] Space Sustainability, *supra* note 4, at 8.

[42] John Matson, International Space Station crew seek refuge during debris scare, SCIENTIFIC AMERICAN (Mar. 12, 2009, 4:49 PM), http://www.scientificamerican.\com/blog/post.cfm?id=international-space-station-crew-se-2009-03-12.

creasing,[43] and there is the odd shower of debris that survives re-entry to hit ground.[44]

An altogether different collision occurred on January 11, 2007, when China launched a missile at its inoperable Fengyn-1C weather satellite, deliberately blowing it into a cloud of debris comprising at least 3,000 trackable pieces that continue to spread out across a large orbital region between 300 and 2,000 km in altitude. NASA's debris experts estimate that the test created perhaps as much as 150,000 pieces of debris too small to track.[45] Many of these pieces remain in the original polar orbit where Earth observation satellites congregate, posing a serious threat to working satellites in LEO for decades.[46] Indeed, on Jan. 22, 2013, debris from the Fengyun 1C satellite collided with the 7.5kg Russian Ball Lens In The Space ("BLITS") satellite.[47]

As to the future, the Inter-Agency Space Debris Coordination Committee's (IADC) 2013 Report[48] has concluded that a rate of catastrophic collisions over the next 200 hundred years would be

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[43] Jim Algar, *Recent events highlight risks from orbiting space Junk,* 44 VAND. J. TRANSNAT'L L. 589 (2011), United Press International (May 5, 2013), *available at* http://www.upi.com/Science_News/Technology/2013/05/05/SciTechTalk-Recent-events-highlight-risks-from-orbiting-space-junk/UPI-23101367751660/. In a sign of the times, it was seen as good news that, according to NASA, there is less than a 10% chance that Estonia's first and only satellite will be destroyed by space debris. *'Less than 10% Chance' Estonia's First Satellite Will Be Destroyed*, ESTONIA PUBLIC BROADCASTING (August 1, 2013 12:58 PM), http://news.err.ee/sci-tech/b65330d3-4385-4d11-bb5c-be431191137d.

[44] *Mysterious Object Drops From The Sky In Ngezi*, NEWSDZE ZIMBABWE (July 18, 2013), http://www.newsdzezimbabwe.co.uk/2013/07/mysterious-object-drops-from-sky-in.html.

[45] NASA Orbital Debris FAQs, *supra* note 33, at 3.

[46] Space Sustainability, *supra* note 4, at 11.

[47] Leonard David, *Russian Satellite Hit by Debris from Chinese Anti-Satellite Test*, Space.com (Mar. 8, 2013, 5:25 PM), http://www.space.com/20138-russian-satellite-chinese-space-junk.html; *See also* Veronika Oleskyn, *What a Mess! Experts Ponder Space Junk Problem*, ASSOCIATED PRESS (Feb. 19, 2009 4:21 PM), http://usatoday30.usatoday.com/tech/science/space/2009-02-19-space-junk_N.htm.

[48] *Stability of the Future LEO Environment*, Inter-Agency Space Debris Coordination Committee (Feb. 2013) (available at http://www.iadc-online.org/index.cgi?item=docs_pub (report assimilates six independent agency reports from NASA, ASI, ESA, ISRO, JAXA, and UKSA) [hereinafter IADC Report]. The IADC is an association of the space agencies of ten countries (China, France, Germany, India, Italy, Japan, Russia, Ukraine, the United Kingdom, and the United States) and the European Space Agency, representing 17 countries of which four (France, Germany, Italy, and the United Kingdom) are also full IADC members.

between 1 in five years and 1 in nine years.[49] A NASA report has concluded that over the next 200 hundred years, "71 catastrophic collisions and 76 non-catastrophic collisions are expected to occur."[50] An even more advanced space debris model concluded that by 2100, there may be as many as 50 near collisions per day.[51] The ever-escalating spiral of space debris causes collisions which lead to more space debris that causes more collisions.

C. Emerging Risk of Harm

Specific descriptions of the consequences of increasing space collisions defy prediction depending on what satellite is struck and what functions it serves. No one can know whether a satellite hit by debris will be of global or only local significance. What can be anticipated is that the satellite will be substantially damaged. Debris is moving at enormous speeds, approximately 25,000-28,000kph.[52] Even a very small object can cause significant harm to anything it collides with. At these speeds, a half-millimeter chip can puncture a spacesuit, and a marble-size object can knock a satellite off course.[53] Satellites are, of course, extremely vulnerable to damage from collision as the shielding required to protect a satellite from debris would add so much weight to the spacecraft

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[49] *Id.* at 13.

[50] Hubert Foy, *Effectiveness of Post Mission Disposal Rule Could Curtail LEO Debris Creation*, SPACE SAFETY MAGAZINE (Oct. 24, 2012, 1:16 PM), http://www.spacesafetymagazine.com/2012/10/24/effectiveness-postmission-disposal-rule-curtail-creation-debris-leo/.

[51] Sergei Nikolaev et al., Brute Force Modeling of the Kessler Syndrome, Lawrence Livermore National Laboratory, 9 (Sept. 10, 2012) http://www.amostech.com /TechnicalPapers/2012/Orbital_Debris/NIKOLAEV.pdf. This "brute force" model differs from the LEGEND model in that it uses near real time data sampling provided by nearly 10 million computer hours of calculations, and possible collisions were referred to as conjunctions which were defined as two objects passing within one hundred meters of each other.

[52] NASA Orbital Debris FAQs, *supra* note 33.

[53] Jennifer M. Seymour, *Note, Containing the Cosmic Crisis: A Proposal for Curbing the Perils of Space Debris*, 10 GEO. INT'L ENVTL. L. REV. 891, 892 (1998): "In Low Earth Orbit ("LEO"), properties are such that an object as small as one centimeter in diameter creates so much energy that it can knock a satellite out of its orbit. A "direct collision of an object the size of a marble, moving at nearly 18,000 miles per hour, has the same destructive force as a 400-pound safe moving at 65 miles per hour" and a "0.5 millimeter paint chip would easily puncture a space suit and kill an astronaut or cosmonaut working outside a spaceship." *See also* Meghan R. Plantz*, Note, Orbital Debris: Out of Space*, 40 GA. J. INT'L & COMP. L. 585, 593-96 (2012).

that, for commercial purposes at least, the value of using space would plummet.[54]

Beyond the pure economic loss and cost of replacing satellites are the secondary impacts for many on-ground operational systems that rely on satellites. A collided-with satellite means that the ground systems that depend on it must instantaneously find backup or suffer a stoppage until the satellite is repaired or replaced. Services outages due to the collision could fall anywhere between mere broadcast outages to full out global crises. Virtually all modern communications, commercial and scientific interests are similarly threatened by collisions.[55]

Electrical grids rely on satellites for communication of data that enables networked monitoring of power usages for optimal efficiency; entire areas of the grid could lose communication with the network and go black. Dams rely on satellite-generated data to warn if a torrential surge of water is errantly diverted or even that an earthen dam could collapse. [56] Mineral and fossil fuel industries rely on satellites to precisely dig, drill, and move recovered resources and heavy equipment; off-shore drilling rigs rely on satellites for telemetry so a drilling platform can maintain a static location to prevent against breaking its drill, spilling crude oil underwater. Perhaps most important, modern peacekeeping and law enforcement forces are heavily satellite-reliant;[57] interruption of their linkages could jeopardize international peace and security. [58]

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[54] *See generally*, *Subject To Orbital Debris Impact*, SPACE SAFETY (Aug. 1, 2013), *available at* http://www.spacesafetymagazine.com/2013/08/01/subject-orbital-debris-impact/#.Ufqt-2qmfZE.twitter.

[55] Industries increasingly rely on satellites for data transfer and fields such as agriculture, geography, hydrology, and oceanography increasingly rely on satellites' data collection capabilities. Robert C. Bird, *Procedural Challenges to Environmental Regulation of Space Debris*, 40 AM. BUS. L.J. 635, 641-642 (2003).

[56] Thirty-one flood control dams in the Northeastern United States have been monitored by satellite since the 1970's, providing remote monitoring to anyone with an internet connection Thomas N. Keefer, *Dam Safety Monitoring & GEOSS Satellite Telemetry*, *available at* http://www.sutron.com/pdfs/goes_satellitetelemetry_damsafetymonitoring.pdf.

[57] "[S]atellites provide essential in-theater secure communications, weather and navigational data for ground, air and fleet operations and threat warning," Joseph S. Imburgia, *Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk*, 44 VAND. J. TRANSNAT'L L. 589, 608 (2011).

[58] It has been no secret that modern navies use satellites for navigation, ship to shore communications, and intelligence gathering. Remotely Piloted Aerial Systems,

Not to be overlooked are the hazards caused by any debris from such a collision impacting Earth.[59]

The real toll of increasing debris collisions is on the risks associated with using orbital space. Debris creates a hostile space environment where satellite use is not viable due to the high risk of damage and the resulting prohibitive insurance premiums. As the frequency of collisions increase, the cost of insuring satellites in harm's way increases.[60] At some point, users will be deterred from placing satellites into especially crowded orbits where, for technical reasons, they would otherwise operate best. Pushing the usable orbits for satellites to higher altitudes degrades performance, costs more, and requires more expensive launch vehicles which, altogether, further increase the cost of insurance. [61]

Ultimately, although the current incidence of debris collisions is low, this is only expected to remain true for a short time, and, "without a collective international legal effort to induce a reduction in space debris, it will only be a matter of time before the free use of space is severely imperiled, if not forever lost."[62]

II. SPACE DEBRIS VIOLATES INTERNATIONAL LAW

Part II asserts the prima facie argument concerning space debris that should be put before the International Court of Jus-

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commonly known as drones, rely on satellites to provide the link between the craft and their pilots at the command center. *Drones: What are they and how do they work?*, BBC (Jan. 31, 2012, 09:37AM), http://www.bbc.co.uk/news/world-south-asia-10713898.

[59] Recent discoveries of parts from the controlled reentry of the Russian Mir space station in Massachusetts demonstrate that even a controlled burn in Earth's atmosphere can lead to dangerous high speed particles hitting densely populated areas. *Man discovers piece of Mir space station in Massachusetts river*, FOX NEWS (Jun. 17, 2013), *available at* http://www.foxnews.com/science/2013/06/17/man-discovers-piece-mir-space-station-in-massachusetts-river/?intcmp=HPBucket.

[60] A single commercial launch failure resulting in a $750 million payout could "wipe out 75 percent of the year's premium income in a single stroke," which would likely cause prices to skyrocket. Peter B. de Selding, *Falling Satellite Insurance Premiums Put Market at Risk of Major Upheaval*, SPACE NEWS (Mar. 2, 2012), http://worldspaceriskforum.com/2012/wp-content/uploads/2012/04/6_Space-News-02_03_2012.pdf.

[61] For a discussion of the relevance of insurance to addressing the risks of space accidents, see Allen Gould, and Orin Linden, *Estimating Satellite Insurance Liabilities*, *available at* http://www.casact.org/pubs/forum/00fforum/00ff047.pdf.

[62] Joseph S. Inburgia, *Space Debris and its threat to National Security: A Proposal for a binding international agreement to clean up the Junk,* 44 VAND. J. TRANSNAT'L L. 589, at 608 (May 2011).

tice. The corpus of space law is built upon the commitment to be in conformity with international law and has always been appreciated as within the larger domain of international law. A fundamental principle of international law posits: "Every internationally wrongful act of a State entails the international responsibility of that State."[63] And it is fundamental that the international legal order must be a coercive order; States that act wrongfully must not escape responsibility.[64] International law would be a hollow shibboleth if no governance regime prescribed rules of conduct and there were no potential for violators of those rules being held accountable.

This principle applies to wrongful acts committed against the international community as a whole.[65] It applies to acts of omission as well as acts of commission; it can apply to a combination of both.[66] Notably for purposes of space debris, States may be responsible for engaging in a series of composite acts that are wrongful in aggregate, even if not every specific act is prohibited.[67] Ultimately, States may be obligated to take precautions to prevent harm or to enforce prohibitions. "In every case, it is by comparing the conduct in fact engaged in by the State with the conduct legally prescribed by the international obligation that one can determine whether or not there is a breach of that obligation."[68]

This argument is presented as a series of four propositions: Viewed from the perspective of outer space as a resource for the benefit of all humanity (Section A), space debris violates two complementary international legal principles: the right of peaceful passage and the principle of responsibility for transboundary harm (Section B), thereby constituting an international environmental nuisance (Section C), as to which the Outer Space Liability Regime is useless for addressing responsibility (Section D).

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[63] Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with commentaries, Rep. of the Int'l Law Comm'n, 53rd Sess., Apr. 23-June 1, July 2-Aug. 10, 2001, at art. 1 (2008) [hereinafter ILC Prevention].

[64] Hans Kelsen, PEACE THROUGH LAW (1944).

[65] Barcelona Traction, Light, and Power Co., Ltd. (Belg. v. Spain), 1970 I.C.J. 3. (Feb. 5).

[66] Corfu Channel Case (U.K. v. Alb.), Merits, 1949 I.C.J. 4 (Apr. 9).

[67] ILC Prevention, *supra* note 63, art. 15.

[68] Draft Articles on Responsibility of States for Internationally Wrongful Acts, with commentaries, Rep. of the Int'l Law Comm'n, 53rd Sess., Apr. 23-June 1, July 2-Aug. 10, 2001, at 55 (2001) [hereinafter ILC Responsibility].

A. Space: A Resource for Humanity's Benefit

Space is a resource for the benefit of all humanity. This status traces to principles of *res communis* (peaceful use by all on behalf of all with freedom of access to all) as well as from principles of *public trust* (preservation of a common good on behalf of the entire international community, including most especially future generations). This status was first recognized as applying broadly to the seas, but there are emerging domains, from biodiversity to bioethics, where humanity's right to protect common resources for its benefit is acknowledged.

The legal significance of "for the benefit of all humanity" is that space must not be exclusively a topic of inter-State negotiation for the benefit of consensus parties. As States bear obligations of general character (*erga omnes*) to each other and to all of us, the boundaries to the freedom of individual State activity in space must be formulated principally at the international level.[69] The law-making process in the domain of outer space has always been inspired by a conscience of superior common interests.[70] In the domain of outer space, it is clear that "for the benefit of humanity" lies at the core of general principles of non-appropriation, of peaceful sues and purposes, and of the extension of the benefits of space exploration to the whole of humanity.

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[69] For a fuller discussion of this principle, see Henry R. Hertzfeld and Frans von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty, Space and Telecommunications Law Program Faculty Publications.* Paper 15 (2005), *available at* http://digitalcommons.unl.edu/spacelaw/15 [hereinafter Hertzfeld and von der Dunk].

[70] For example, a 1982 Resolution known as UNISPACE'82, promulgated rules for balancing States' interests over broadcasts involving their respective territories with other States; interests in preserving the freedom of space activities and information. (United Nations G.A. Res. 37/90 (1982)). A 1986 Resolution addressed remote sensing. (United Nations G.A. A/Res. 41/65 (1986)). In 2000-01, the COPUOS Legal Subcommittee reached the understanding that access to the geostationary orbit out to take place in an equitable way; thus, the country which had already attained such access ought to take "all the practicable measures" to render it possible for other countries to have it. (United Nations G.A. A/AC. 105/738 (April 2000)). Both COPUOS and the International Telecommunication Union (ITU) contributed to reaching the recognition that the geostationary orbit is a limited natural resource, and that all countries ought to be able to count on the possibility of access to that orbit, for it not to be regarded as a privilege for a given number of satellites which are in place in it. (United Nations A/AC.105/C.1/2013/CRP.17 (2013)). *See generally*, Gennady M. Danilenko, *Outer Space and the Multilateral Treaty-Making Process*, 4 HIGH TECH. L.J. 217, 218-24 (1990).

Indeed, the establishment and continued relevance of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), ordained by the UNGA to act as a caretaker on behalf of humanity, signifies the global commitment to coordinated and cooperative effort as distinct from anarchic sovereign action.[71] In establishing the UNCOPUOS, the General Assembly recognized that outer space shall not be subject to national appropriation by claim of sovereignty, by means of use, or by occupation. The UNCOPUOS has been given the task to develop peaceful cooperation of States in space matters and to codify the rules that would govern space, submitting them to the General Assembly for final approval.[72] Other international governance organizations, devised for different domains of activities in space, are increasingly asserting humanity's diverse interests in space. [73] For example, the rules of the International Telecommunication Union (ITU) apply to the use of satellites for specific purposes. As more satellites have become included in terrestrial networks, more rules re-

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[71] *See generally*, Franz von der Donk, *Liability Versus Responsibility in Space Law: Misconception or Misconstruction?*, PROCEEDINGS OF THE THIRTY-FOURTH COLLOQUIUM ON THE LAW OF OUTER SPACE, 363-71 (1992), *available at* http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1020&context=spacelaw&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fq%3DVon%2Bde%2BDunk%252C%2Bspace%26btnG%3D%26hl%3Den%26as_sdt%3D0%252C14#search=%22Von%20de%20Dunk%2C%20space%22.

[72] Faustino Pocar, *The Normative Role of UNCOPUOS*, *in* OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS: ESSAYS PUBLISHED FOR THE 30TH ANNIVERSARY OF THE SPACE TREATY 415 (Gabriel Lafferranderie & Daphné Crowther eds., 1997) [hereinafter Pocar]. COPUOS has been given the task to develop a peaceful cooperation of states in space matters and to codify the rules that would govern it, submitting them to the General Assembly for final approval. COPUOS has been able to elaborate various treaties and declarations of principles that represent the codification of an impressive series of principles which has been expressly adhered to by a large majority of the international community.

[73] In addition to COPUOS, various international organizations have been established with specific responsibilities related to outer space. These include: (a) the International Telecommunications Satellite Organization (INTELSAT); (b) the International Maritime Satellite Organization (INMARSAT); (c) CEOS: Committee on Earth Observation Satellites; (d) EO-ICWG: Earth Observation – International Coordination Working Group; (e) IPOMS—International Polar Orbiting Meteorological Satellites Group; (f) CGMS – Coordination Group on Geosynchronous Meteorological Satellites; (g) International Space Life Science Strategic Planning Working Group; (h) ISOCS: Inter Satellite Optical Communications Systems (Working group); and (i) SAF: Space Agency Forum – Created in 1993 between government representatives of countries having space activities, with intention of having a forum for exchange of views.

garding telecommunications as a whole have become relevant for outer space activities.[74]

Governance of space on behalf of humanity must include denunciation of natural resource despoliation.[75] A claim of harm to a resource essential to humanity rests on the proposition that each generation has a manifest obligation to guard the common good of us all and is therefore responsible for advancing the inherent human aspiration for trans-generational progress. Sustainable use and scientific investigation of resources must be encouraged, even including appropriation of some resources in order that they may be put to effective use, but ruining resources that are necessary to humanity's well-being must be prohibited. By this logic, States are responsible for such harm because States are legal executors of obligations, whether or not defined explicitly by their agreement and certainly regardless of their pursuit of sovereign self-interest. With regard to the harm to the space resource, responsible States must be held to account.

B. Space Debris Violates Two Complementary Legal Principles

Relevant international law concerning space debris emerges from two legal principles which should be viewed as complementary: (1) the internationally protected right of peaceful passage, and (2) the prohibition against causing transboundary harm. While these principles have emerged from different threads of international law and sometimes use different terminology, they express a common concern for the legal prerogatives of humanity to peaceful use of common resources.

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[74] *See generally*, Federal Aviation Administration: Office of Commercial Space Transportation website, *available at* http://www.faa.gov/about/office_org/headquarters_offices/ast/about/.

[75] According to Professor Trindade, "It is generally recognized that certain basic principles have oriented the construction of the new concept of common heritage of humanity, namely: the principles of non-appropriation and of exclusion of State sovereignty, of peaceful uses and purposes, of freedom of access and scientific investigation, and of rational *gestion* of the resources and equitable sharing to the benefit of all humanity." ANTONIO AUGUSTO CANCADO TRINDADE, 6 INTERNATIONAL LAW FOR HUMANITY, at 330 (The Hague Academy of International Law Mongraphs, Martinus Nijhoff Publishers, 2010) [hereinafter TRINDADE].

1. Right of Peaceful Passage

Perhaps the oldest and most universally recognized rule of international law is the right of carriers to peaceful use and transit of common straits and spaces. The right is premised on the essence of international law's mission of governing interaction among States, enabling both freedom of commerce and freedom of travel. The sea is *res communis par excellence.* According to Grotius, the right of peaceful passage is the 'most specific and unimpeachable axiom of the Law of Nations, called a primary rule or first principle, the spirit of which is self-evident and immutable, to wit: Every nation is free to travel to every other nation and to trade with it."[76] Simply offered, no State may impede peaceful passage.

The International Court of Justice entrenched the right of peaceful passage into international law in the *Corfu Channel Case* in 1949.[77] In 1946, the British ships Saumarez and Volage, while traveling through the Corfu Strait, struck several mines causing extensive damage and death and injuries to over eighty naval personnel. The court, finding that Albania— in whose waters lay the mines— had constructive knowledge of the mines, turned to whether Albania had violated a legal obligation. The Court specifically declined to rest its judgment on treaty law. Instead, the Court applied "certain general and well-recognized principles, namely elementary considerations of humanity, even more exacting in peace than in war; the principle of the freedom of maritime communication; and every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States."[78] The International Court of Justice held that foreign vessels have the right to navigate "through straits used for international navigation between two parts of the high seas without the previous authorization of a coastal state, provided that the pas-

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[76] Solomon Slonim, *The Right of Innocent Passage and the 1958 Geneva Conference on the Law of the Sea*, 5 COLUM J. TRANSNAT'L L. 96 (1966).

[77] Corfu Channel Case (United Kingdom v. Albania); Merits, I.C.J. Reports 1949, p. 4.

[78] *Id*. at 22.

sage is innocent."[79] In other words, the Court affirmed the concept of an international strait with a rule of freedom of navigation.[80]

Almost a century ago, the need to ensure freedom of navigation in waterways was recognized by the Barcelona Convention which "granted the freedom of navigation on conditions of perfect equality to vessels of the signatory state… on navigable waterways… ."[81] Decades later, the international community made clear that this right is intertwined with responsibility for "any act of willful and serious pollution."[82] This principle must apply to space law which has its roots in the traditions of maritime law.[83]

Now, the need for legal protection of safe transit in space is arguably even greater than on the seas where ships are readily maneuverable and where collisions (excepting oil spills) rarely damage any nation's territory nor even have secondary consequences for other property.[84] It takes little imagination to see that orbits are straits, *i.e.,* natural passageways used for navigation. They are created by the reality of how they are used by virtue of their geospatial position. Straits are channels that facilitate the transfer of people or goods between two larger spaces.[85] Orbits are straits to and among modern information systems that provide our most indispensable data streams. Moreover, orbits are rings through which spacecraft must cross in order to reach outer space.

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[79] *Id*. at 28.

[80] *See generally*, Jorge E. Vinuales, *The Contribution of the International Court of Justice to the Development of International Environmental Law: A Contemporary Assessment*, 32 FORDHAM INT'l L.J. 232 (2008).

[81] International Convention Concerning the Regime of Navigable Waterways of International Concern, Apr. 20, 1921, 7 L.N.T.S. p. 37 (*available at* http://www.legislation.gov.hk/doc/multi_904v1.pdf).

[82] United Nations Convention on the Law of the Sea, Part II, Section 3, art. 19 (2)(h).

[83] J.H. Barker, *A537, Space Orientation Course: Lesson 1, Intro/Space Policy/Organizations*, US Army Command and General Staff College, *available at* http://www.core.org.cn/NR/rdonlyres/Aeronautics-and-Astronautics/16-891JSpace-Policy-SeminarSpring2003/FE331D36-2C5F-4C94-9631-461B7C66A900/0/notes1b.pdf.

[84] *See* Brian Beck, *The Next, Small, Step for Humanity: Fixing The Inadequacies of the International Space Law Treaty Regime to Accommodate the Modern Space Flight Industry*, 19 ALB. L.J. SCI. AND TECH. 1, 9 (2009).

[85] *See generally*, William L. Schachte Jr. & J. Peter A. Bernhardt, *International Straits and Navigational Freedoms*, 33 VA. J. INT'L L. 527 (1993). Indeed, the customary international definition of innocent passage was codified in Article 14 of the 1958 Geneva Convention on the Territorial Sea and Contiguous Zone.

Like sea straits, orbits face problems due to overuse and pollution by the accumulating debris in the commonly-used bands.

By the laws of physics, satellites are best operated in narrow orbital bands that facilitate the transfer of signals, images, and information between two (and typically many more) stations on Earth. In the same way that historically-appreciated straits provide the only access to certain bodies of water, some orbits exclusively possess properties that are highly sought-after for essential telecommunications and other purposes. Just as water straits are defined by where they are and how they are used, and just as international law protects access and peaceful use of these straits, so international law must recognize orbital straits and protect access and peaceful use.

2. Responsibility for Transboundary Harm

The principle of responsibility for transboundary harm – a principle that is highly complementary to the right of free transit – has been built on the ancient Roman law principle that no one has a right to use property so as to cause another significant harm: *sic utere tuo ut alienum non laedas*.[86] Indeed, like the right of free transit, the responsibility of States for harm outside their jurisdiction (whether of another nation or of the commons) is so widely and incontrovertibly accepted as to be self-evident.

At the core is Principle 2 of the Rio Declaration of 1992, which provides that States have "the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."[87] Principle 2 hailed from the *Trail Smelter* arbitration[88] holding that no State has the right to use or permit the use of its territory in such a manner as to cause injury to the

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[86] *See generally*, A.E. Boyle, *Globalising Environmental Liability: The Interplay of National and International Law*, 17 J. ENV. L. 3 (2005).

[87] *Report of the United Nations Conference on Environment and Development*, Principle 13, United Nations General Assembly (Rio de Janeiro, June 3-14 1992), *available at* http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm (last visited Aug. 13, 2013).

[88] *The Trail Smelter Arbitration Case* (U.S. v. Canada) 1941, U.N. REP. INT'L ARB. AWARDS 1905 (1949).

territory of another or the properties or person therein.[89] This principle is also grounded in the World Charter for Nature, under which States shall "[e]nsure that activities within their jurisdictions or control do not cause damage to the natural systems located within other States or in the areas beyond the limits of national jurisdiction."[90] Moreover, prevention of transboundary harm to the environment, persons, and property is a legal imperative of many multilateral treaties concerning protection of the environment, nuclear accidents, international watercourses, management of hazardous wastes, and prevention of marine pollution. It has also been accepted as an important principle in regimes governing unique domains of the global commons such as Antarctica.[91]

As a fundamental matter of international law, this obligation is not merely an oft-cited but non-binding aspiration; its breach must give rise to liability. As earlier stated, every internationally wrongful act of a State entails its international responsibility. Breach of the obligation to prevent transboundary harm is, in terms of international law, a *delict*.[92] States are under a proactive obligation to cooperate "to develop further the international law regarding liability and compensation for the victims of pollution or other environmental damage caused by activities within the jurisdiction or control of such states to areas beyond their jurisdiction."[93] International law thus prescribes the imperative to ensure enforceable legal responsibility against States that cause transboundary harm.

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[89] *See generally*, Thomas Gehring & Markus Jachtenfuchs, *Liability for Transboundary Environmental Damage – Towards a General Liability Regime?*, 4 EJIL 92 (1993).

[90] World Charter for Nature, A/RES/37/7 (1982), Part III, para. 21(d), *available at* http://www.un.org/documents/ga/res/37/a37r007.htm.

[91] *See generally*, Mary Button, *Cleaning Up Space: The Madrid Protocol to the Antarctic Treaty as a Model for Regulating Orbital Debris*, 37 WM. & MARY ENVTL. L. & POL'Y REV. 539 (2013).

[92] The ILC prefers the French term ….. on the grounds that it does not imply a distinction between the doing of an act that is wrongful and the wrongful not doing of an act. United Nations, Report of the International Law Commission, 53rd Sess., A/56/10 (2001), at 68 [hereinafter ILC Report]. By using the English term, I mean to imply no such distinction as will hopefully be clear through the remainder of this article.

[93] Declaration of the United Nations Conference on the Human Environment A/CONF. 48/14 and Corr. 1; 9 International Legal Materials 1416 (1972).

The International Law Commission (ILC) has long grappled with the task of further developing the international law of State responsibility, specifying that any ultra-hazardous activity involving a risk of significant transboundary harm is within the principle's scope. An ultra-hazardous activity is an activity with a significant (more than detectable) danger that is rarely expected to materialize but might assume, on that rare occasion, grave proportions.[94] The harm must lead to a real detrimental effect on matters such as, for example, human health, industry, property, environment or agriculture in other States."[95]

At the core of the principle of responsibility is an emphasis on the duty to prevent in sharp distinction from an obligation to compensate. "Prevention should be a preferred policy because compensation in case of harm often cannot restore the situation prevailing prior to the event or accident."[96] Explaining this emphasis, the ILC Commentary offers:

> Discharge of the duty of prevention or due diligence is all the more required as knowledge regarding the operation of hazardous activities, materials used and the process of managing them and the risks involved is steadily growing. From a legal point of view, the enhanced ability to trace the chain of causation, i.e. the physical link between the cause (activity) and the effect (harm), and even the several intermediate links in such a chain of causation, makes it also imperative for operators of hazardous activities to take all steps necessary to prevent harm. In any event, prevention as a policy is better than cure.[97]

The principle of responsibility for transboundary harm is, ultimately, a limitation on sovereignty. Simply offered, with regard to any activity which involves the risk of causing significant transboundary harm to persons, property, or the environment, States are obligated to take all appropriate measures to prevent

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[94] ILC Report, *supra* note 92, at *Chapter V: International Liability for Injurious Consequences Arising out of Acts Not Prohibited by International Law* (*Prevention of Transboundary Harm From Hazardous Activities*), at 381 [hereinafter ILC Report General Commentary].

[95] *Id.* at 388.

[96] *Id.* at 377.

[97] *Id.* at 377.

significant transboundary harm. "The obligation of the State of origin to take preventive or minimization measures is one of due diligence. It is the conduct of the State of origin that will determine whether the State has complied with its obligation under the present articles."[98] Thus, States must ensure that their activities take into account the interests of other States and of activities taking place in outer space or on the high seas. "[T]he freedom they have within their own jurisdiction is not unlimited."[99]

This responsibility must be progressive: its application is designed to grow. According to the ILC, "What would be considered a reasonable standard of care or due diligence may change with time; what might be considered an appropriate and reasonable procedure, standard or rule at one point in time may not be considered as such at some point in the future. Hence, due diligence in ensuring safety requires a State to keep abreast of technological changes and scientific developments."[100] National authorities should endeavor, therefore, to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution.[101]

Clearly, the principle of responsibility for transboundary harm is complementary with the right of free transit. Both legal principles are but variant expressions of the same fundamental international legal obligation to responsibly use resources on behalf of all, exercising due care and consideration of the rights of others, including the rights of others who are unable now to represent their interests. It is, accordingly, a breach of this obligation to cause harm to such resources. This obligation of common responsible use is defined not principally by the avoidance of harm to any particular victim but by the obligation to sustain the availability of means of preventing such harm.[102] Space debris clearly contravenes the right of peaceful passage and the principle of responsibility for transboundary harm.

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[98] *Id.* at 391.

[99] *Id.* at 370.

[100] *Id.* at 394.

[101] ILC Prevention, *supra* note 63, art. 10, p. 374.

[102] *See* Thomas W. Merrill, *Golden Rules for Transboundary Pollution*, 46 DUKE L.J. 931, 970 (1997).

C. Space Debris: An International Environmental Nuisance

Space debris must be considered an international environmental nuisance. [103] The overarching legal violation is that producers of space debris harm vital interests of humanity and therefore must be required to consider, diminish, and remediate that harm on behalf of humanity. Space debris is an international environmental nuisance that stems not so much from a single wrongful act as a pervasive release of material that causes harm into an area that is not in any single State's jurisdiction and onto victims through no fault of their own. Space debris is by no means the only example of this type of environmental nuisance in the world today; analogies can be drawn to problems of deforestation, ocean despoliation, and even to climate change. That the harm of space debris is to humanity's technology rather than to any biota does not undercut its consideration as an environmental nuisance.

Environmental nuisances have four attributes that are directly relevant to space debris. First, a nuisance typically has a more extended duration than other types of wrongful behavior. The harm is chronic; it lasts until the nuisance is remediated. If the harmful conduct is not enjoined, the nuisance tends to worsen. For this reason, many nuisances are remedied through some type of specific performance whereby the parties responsible for the nuisance modify the condition as much as is reasonable under the circumstances.

Second, a nuisance has a low threshold of fault. A nuisance does not imply malevolence nor any specific intent to inflict the harm. A *public nuisance* was long ago prosecuted as a criminal action to protect the general public's right to enjoy land,[104] but modern concepts of nuisance impose only civil accountability. Nuisance's standard of intent is therefore low: the tortfeasor must only have acted with careless disregard of the consequences. Indeed, a nuisance is typically characterized by conduct that gener-

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[103] A nuisance is a condition that does not exist in nature and which impedes other persons' enjoyment of their life and property. Per the Restatement (Second) of Torts, "[a] public nuisance is an unreasonable interference with a right common to the general public." RESTATEMENT (SECOND) OF TORTS §821B (1979).

[104] Samantha Lawson, *Note, The Conundrum of Climate Change Causation: Using Market Share Liability to Satisfy the Identification Requirement in* Native Village of Kivalina v. ExxonMobil Co., 22 FORDHAM ENVTL. L. REV. 433, 438-39 (2011).

ates harm only in the aggregate, often in conjunction with the conduct of many others who may have scant knowledge of their cumulative contributions.[105]

Third, and perhaps most significant, nuisances defy conceptions of accountability because attributing causation of harm to any specific incident, much less assessing responsibility for future economic loss, is very difficult.[106] The difficulty lies in identifying clear pathways of causation from a specific source of the nuisance to a specifically harmed victim at any particular location in connection with collective dangers to many people at many sites. Thus, recovery may be complicated because a single victim rarely can establish a special harm different in kind from the general public. Moreover, an aspect of environmental nuisance that specifically pertains to space debris is how it often induces avoidance: the victims change their behavior in order to not be adversely affected. Requiring proof of direct harm to a singular claimant in such cases would produce the counter-intuitive result that the larger the scope of those affected by the nuisance, the smaller an individual victim's likelihood of being able to initiate a nuisance suit.[107]

Fourth, a significant conceptual difficulty with appreciating space debris as a nuisance – unfortunately, a conceptual difficulty that is quickly clarifying – is that the future harm is merely conjectural. Nuisances often cause harms which are suffered after (sometimes, long after) the occurrence of the harmful conduct. A nuisance may begin as innocuous conduct, and no one is so adversely affected as to bring a claim. How might liability be as-

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[105] "The sheer diversity and complexity of cross-border environmental harms has often made it difficult to determine who is responsible for what to whom". MASON, *supra* note 17, at 3.

[106] *Id.* at 4.

[107] *See* Catherine Connors, *Public Nuisance: Causation and Liability Theories, Nuisance Law*, *available at* http://www.nuisancelaw.com/learn/causation, who argues that attempts have been made to circumvent this difficulty on a theory of analogy to multiple polluters such as into a stream, in which case each polluter should be liable regardless of ability to discern whose material caused which harm and where. *See also*, Denise E. Antolini, *Modernizing Public Nuisance: Solving the Paradox of the Special Injury Rule*, 28 ECOLOGY L.Q. 755, 757-59 (2001). Mason points out that it is an inherent condition of global environmental challenges presents overwhelming challenges of attributing causes and consequences to actors for catastrophic risks. MASON, *supra* note 17.

sessed as to hypothetical future harm? Yet, over time and with incremental addition to the nuisance, the harms grow. By the time the actual damage becomes too great to bear, it is too late for some backward-facing character of accountability that entails post-damage assessment and attribution of responsibility.[108] This is the inherent nature of nuisances and why the law requires preventive action, even if no catastrophe has yet been suffered.[109]

In this regard, it was difficult to calculate how liability for space debris could be assessed as to catastrophes that may or may not happen in the future. As recounted in Part I, however, the actuality of space debris damage may be crossing the edge from hypothetical to demonstrable. What is certain is that the harm will only grow with more manifest consequences over time.

D. Inutility of The Outer Space Liability Convention

This section asserts that the Outer Space Liability Convention[110] is inapposite to the problem of space debris. Spacefaring States that have created space debris have negotiated a liability regime that, deliberately or just conveniently, fails to adequately address the problem of space debris.[111] Indeed, damage for debris in space, was, at the time of the Convention's drafting, considered "relatively exotic,"[112] and the Liability Convention does not seriously focus on the debris problem.

The Liability Convention broadly defines damage[113] and sets forth a two-tiered liability scheme: if the damage is caused to the

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[108] MASON, *supra* note 17, at 4.

[109] *See generally* Thomas Gehring & Markus Jachtenfuchs, *Liability for Transboundary Environmental Damage towards a General Liability Regime?,* 4 EUM. J. INT'L. 92, 103, (1993), *available at* www.ejil.org/pdfs/4/1/1228.pdf.

[110] Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 961 UNTS 187; 24 UST 2389; 10 ILM 965, Article I [hereinafter Liability Convention].

[111] According to Akers, *supra* note 35: "with the rise of technology and space commercialization, particularly in private industry, the entities responsible for the majority of objects launched into space have a pecuniary interest in leaving the terms purposefully vague to avoid liability for damage caused by their space debris."

[112] *Id.* at 289.

[113] Under the Liability Convention, Article I, the definition of "damage" broadly includes four kinds of recoverable harm such as loss of life, personal injury, other impairment of health and loss of or damage to property. *See* Carl Q. Christol, *International Liability for Damage Caused by Space Objects*, 74 AM. J. INT'L 346, 359 (1980).

surface of the earth or aircraft in flight, liability is absolute in the sense that no showing of fault is required.[114] If the damage is caused to objects in space, by contrast, fault must be established; liability does not attach for damages if the launching State is not at fault. Only a State can present a claim for compensation; if a private party is injured, it must rely on its State to proceed with a claim on its behalf.[115] The measure of damages is "to restore the aggrieved party to the condition which would have existed if the damage had not occurred.[116] Such recovery may be for only direct damage; indirect damage is not recoverable. Thus, if debris falls on an electrical facility, the damage to the facility may be the basis of recovery, but whatever damage follows from loss of electricity is for the victim State to absorb.[117]

Notably, damage to environmental resources that are not within any State's jurisdiction may be outside the Convention's liability scheme; it covers only damage to property belonging to States, intergovernmental organizations, or natural/juridical persons.[118] The Convention provides no basis by which a State may be liable for generally polluting Earth's orbit. Moreover, damage to

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[114] Liability Convention, *supra* note 110, arts. II & IV. Absolute liability applies even in cases of force majeure. The negotiators recognized that a claimant state faces insurmountable obstacles to produce evidence of fault which is known exclusively by the launching state, and the claimant state could not reasonably do anything to protect itself from harm. Despite no liability ceiling, there is one exception to the rule of absolute liability. It is when a launching State can prove that such damage has resulted wholly or partially for the following reasons: (1) gross negligence; or (2) 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. The concept of liability based on fault may be applied when damage is caused beyond the surface of the Earth by a space object of one launching State to persons or property of another launching State.

[115] *Id.* art. VII. Claims not settled within a year shall be submitted to the 3-member Claims Commission –one appointed by the launching State, one by the claimant State, and one chosen by both parties. *Id.* at arts. XIV-XV. The Claim Commission's decision or award is binding only if the parties so agree. Otherwise, the Commission can only recommend a final award. *Id.* art. XIX.

[116] Thomas Gehring & Markus Jachtenfuchs, *Liability for Transboundary Environmental Damage towards a General Liability Regime?,* 4 EUM. J. INT'LL . 92, 103, (1993), *available at* www.ejil.org/pdfs/4/1/1228.pdf.

[117] 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. 281-82 (1984).

[118] Lauren Bressack, *Addressing The Problem of Orbital Pollution: Defining a Standard of Care To Hold Polluters Accountable*, 43 Geo. Wash. Int'l L. Rev. 741, 743-744 (2011).

objects in space may not be evident until long after the incident, complicating proof of causation and determination of damages. Yet, under the Liability Convention, States must present a claim to the launching State within one year following the occurrence of damage or the identification of the responsible launching State even if the claimant state cannot establish the full extent of damage within that time limit.[119]

The Liability Convention has been at the crux of a dispute only once, and even then was not a part of its resolution. In January 1978, a Soviet nuclear reactor satellite containing uranium-235 re-entered the atmosphere and spread radioactive debris throughout western Canada. Canada sought damages asserting that the Soviet Union failed to warn about the danger associated with the satellite re-entry. Many of the fragments discovered by the Canadian government contained lethal levels of radioactivity. During the course of Canada's search operations, it unsuccessfully requested that the Soviet Union release the technical information necessary to locate all of the debris and assess the harmful effects. Canada spent $14 million cleaning up the radioactive debris. In its Article II claim under the Liability Convention, Canada sought $6 million in damages from the Soviets. Ultimately, the countries settled for $3 million in 1981. The Soviet Union never admitted liability, and the legal procedures established in the Liability Convention were not used to resolve the dispute.[120]

It is difficult to envision how the Liability Convention could be useful for addressing the problem of space debris. Conceivably, a State whose satellite is struck by a piece of debris could sue the State that is responsible for the debris. The facts would have to establish a direct causal connection to the responsible State's space activity and that such at activity constituted fault. Even if successful, the claimant State could recover only direct damages to the struck satellite, at most the cost of a replacement. In evaluating whether to proceed, of course, the claimant State would have to consider that, as a State that is itself responsible for some space debris, it may be wise to quietly settle the dispute.

More central to this article's argument is that the system established by the Liability Convention does not include any capaci-

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[119] Liability Convention, *supra* note 110, art. X.

[120] Akers, *supra* note 35, at 291.

ty to hear claims from all of humanity that want abatement of the problem of space debris. The Outer Space Liability Regime's requirement of proof that the accused nation wrongfully caused harm to a specific nation has little relevance to advancing a legal claim based on a significant harm to humanity and planetary sustainability. The Liability Convention misconceives the injured parties, which are not (at least not exclusively) States, but are all of us and our heirs, and it certainly mischaracterizes the wrongfully caused injury as a past impact rather than a chronic and impending nuisance. International law certainly accepts that a treaty may allocate various States' responsibilities for their harmful activity, but the Liability Convention is merely a contract by the polluters to deny legal responsibility for their pollution.

III. RESPONSIBILITY FOR SPACE DEBRIS PREVENTION AND REMEDIATION

The legal standard of responsibility for space debris is a general intent to commit the acts that have created or continue to contribute to the nuisance. It is a core principle of international law that polluters bear legal responsibility for preventing and remediating its pollution;[121] polluters here defined as launching entities, generally a State. With regard to the nuisance of space debris, the wrongful act incurring responsibility is the act of contributing to the nuisance. As already discussed, the legal delict of environmental nuisance does not require specific intent to inflict harm. It is sufficient that there is intent to do the act which contributes to the nuisance, even if the actor did not intend that result.

A launching entity's responsibility is retrospective, continuing, and prospective. Put simply, as every spacefaring State has and continues to contribute to space debris, every spacefaring State is legally responsible in common and shares legal responsibility to address the problem of space debris. This responsibility is both preventive and remedial: each State must, throughout its space activities, prevent worsening the space debris nuisance, and

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[121] "[T]he 'polluter pays' principle [is] now enshrined as [a] universal element of international environmental law. *See generally*, Robert V. Percival, *Liability for Environmental Harm and Emerging Global Environmental Law*, 25 MD. J. INT'L L. 37 (2010).

each responsible State must remedially contribute to cleaning up existing debris. The ILC offers that, among States that are responsible for the same internationally wrongful act, each State is responsible.[122] As joint tortfeasors, the question of how much liability for harm a particular State should bear can be considered in fashioning the remedy, but no State may be absolved of responsibility merely by virtue of another State's responsibility.[123]

With these principals in mind, an ICJ ruling on space debris should propound the following three propositions:

> A. The intentional destruction of space equipment thereby deliberately creating or expanding debris must be prohibited. Violation of this prohibition must be an international delict for which the responsible State bears legal consequences.
>
> B. States launching equipment into space bear a legal obligation for preventing debris by enabling safe and proper operation of that equipment and disposal of its remains. Satisfaction of international standards at the time of launch should satisfy this obligation. Non-satisfaction of international standards should incur responsibility for the costs of proper remediation (discussed below) as well as whatever consequences ensue.
>
> C. All spacefaring States share common but differentiated responsibilities for safe and peaceful disposal of existing debris in proportion to their overall contribution to the space debris nuisance. While designing the mechanism for execution of this responsibility necessarily entails multilateral negotiation and is beyond the purview of a court, proportional responsibility should strive for international capacity to remove debris from principal orbits and away from danger. Proactive pursuit of peaceful disposal of debris should be incentivized in humanity's interests.

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[122] ILC Report, *supra* note 92, *at Responsibility of States for Internationally Wrongful Acts*, art. 47. The ILC offers the example of several States contributing to polluting a river by the separate discharge of pollutants. ILC Report General Commentary, *supra* note 94, at 317.

[123] *See generally*, Andre Nollkaemper & Dov Jacobs, *Shared Responsibility in International Law: A Conceptual Framework*, 33 MICHIGAN J. INT'L LAW 359 (2012).

A. Prohibition on Intentional Creation of Space Debris

Intentional creation of substantial and irremediable debris must be prohibited. Although no spacefaring State should be absolved of responsibility because of a lack of intent to cause harm, any State that has deliberately sought to create debris or acted with exceptional disregard of its behavior's likely consequences must be held accountable for its intentional wrongdoing. An intentionally destructive act, worse than a failure to prevent an accident, must be declared a delict for which the responsible State or other entity is responsible. Once the causal trigger, in most cases a missile, is fired, little, if anything, can be done to remedy the debris mess afterwards. Therefore, the execution of the intention to explode space equipment, even inoperative spacecraft, must be categorically prohibited.[124]

It is unfortunate that this legal rule was not made clearer before the Chinese ASAT test. There is no doubt of China's responsibility for destroying its dead satellite. Arguments about its sovereignty and the limited scope of treaties banning anti-satellite tests are, in this context, not central to the fact that China created a horrible mess out in space and must be responsible for cleaning it up. The problem, of course, is that cleanup is impossible. No legal obligation can successfully compel anyone to clean it up. The damage is done and cannot be undone.

International law must be satisfied through other means. It would be reasonable to treat the Chinese demonstration of its ASAT weapon capabilities as an intentional and deliberate action to create debris for which China bears responsibility. Although China cannot clean up the tens of thousands of debris pieces it created, it can be obligated to bear an excessive share of the cost of cleaning up other debris, not necessarily its own. As will soon be discussed, cleaning up space debris is going to require substantial investment, and it would be appropriate to weight China's responsibility for intentional debris construction into the broader effort for proper debris remediation.

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[124] For a discussion of why the United States shoot-down of its own satellite in 2008 does not rise to the level of intentional creation of debris, see Nicholas L. Johnson, *Recent Developments in Space Debris Mitigation Policy and Practices*, (2006) *available at* http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20060052514_2006254659.pdf.

B. Prevention— Launching States' Obligation To Enable Proper Disposal

Spacecraft, satellites and other equipment must continue to be launched into space; they are too economically and scientifically valuable. It is imperative, therefore, to reduce risks of debris of launched equipment: (1) while in service, and (2) upon conclusion of its utility.

1. Prevention of Debris During Service

Concern for minimizing space debris from new launches, whether from normal operations or inadvertent break-up, hails to 1979 when NASA established its Orbital Debris Program to advance research on orbital debris and to place the dangers of debris on the international space policy agenda. Among the key challenges were how to create less debris when releasing a satellite into orbit, how to optimize collision avoidance capabilities, and how to enable tethering systems to stay intact under stress.[125] NASA and the European Space Agency (ESA) held bilateral discussions, and, in the 1990s, NASA issued its "Orbital Debris Mitigation Standard Practices."[126] Other countries and organizations, including

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[125] For example, NASA Procedural Requirements (NPR) 8715.6, "NASA Procedural Requirements for Limiting Orbital Debris," requires each program and project to conduct a formal assessment of the potential to generate orbital debris during deployment, mission operations, and after the mission has been terminated. This NASA-STD establishes requirements for (1) limiting the generation of orbital debris, (2) assessing the risk of collision with existing space debris, (3) assessing the potential of space structures to impact the surface of the Earth, and (4) assessing and limiting the risk associated with the end of mission (EOM) of a space object.

[126] *See* NASA Technical Standard 8719.14A *available at* http://www.hq.nasa.gov/office/codeq/doctree/871914.pdf. Two years later, the U.S. Government developed a set of *Orbital Debris Mitigation Standard Practices* based on the NASA guidelines. In 2001, the U.S. government formally approved the Orbital Debris Mitigation Standard Practices (Standard Practices). These guidelines address how to: (1)restrict the creation of debris during normal operations, (2) plan operations to minimize the risk of explosions in orbit; and (3) design of a safe flight plan and "operational configuration" to minimize the risk of collision with other objects in the space environment. U.S. Government, *Orbital Debris Mitigation Standard Practices*, 1997, http://www.orbitaldebris.jsc.nasa.gov/library/USG_OD_Standard_Practices.pdf (Sept. 5, 2012). The Department of Defense (DoD) has implemented rules that track closely with U.S. Standard Practices. Directive-Type Memorandum (DTM) 09-025 – Space Systems Acquisition Policy (SSAP), *available at* http://www.dtic.mil/whs/directives/corres/pdf/DTM-09-025.pdf. In addition to adhering to the national Standard Practices, the National Aeronautics and Space Administration (NASA) has established

Japan, France, Russia, and the European Space Agency (ESA), have promulgated their own orbital debris mitigation guidelines.[127]

Multilateral negotiations among space agencies led to the formation of the Inter-Agency Space Debris Coordination Committee (IADC) in 1993,[128] which propounded a 90% post mission disposal rate for member agencies and prepared a set of preventive measures that have been adopted by the United Nations General Assembly.[129] Meanwhile, the International Organization for Standards (ISO) established the Orbital Debris Coordination Working Group to develop *Standards for Space Debris Mitigation* that provide guidance for manufacturers and operators on best practices that strive to achieve debris mitigation goals and thereby build confidence that satellites comply with national and international standards.[130]

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the NASA Safety Standard. This document overlaps considerably with the Standard Practices by providing for debris assessments covering normal operations, accidental explosions and collisions, and spacecraft disposal. *See generally Orbital Debris Mitigation: Regulatory Challenges and Market Opportunities*, *available at* http://www.futron.com/upload/wysiwyg/Resources/Whitepapers/Orbital_Debris_Mitigation_0306.pdf. These standards have been incorporated in to the National Policy on Space In 2010, National Space Policy of the United States of America. *See generally*, National Space Policy of the United States of America (June 28, 2010), *available at* www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf [hereinafter National Space Policy].

[127] *See* Sergio Marchisio, *Space Debris Mitigation and Space Law*, Presentation to The IV African Leadership Conference on Space Science and Technology for Sustainable Development, *available at* http://www.unoosa.org/pdf/bst/ALC2010/13_Marchisio_Space_debris_mitigation_and_space_law_Mombasa_September_2011.pdf.

[128] See IADC Assessment Report for 2011, IADC-12-06 (April 2013), *available at* http://www.iadc-online.org/Documents/IADC-2012 06,%20IADC%20Annual%20Report%20for%202011.pdf.

[129] Formal adoption by United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS) in its Debris Mitigation Guidelines came in 2007, United Nations, *Report of the Committee on the Peaceful Uses of Outer Space* (A/62/20), United Nations, 2007, http://www.oosa.unvienna.org/pdf/gadocs/A_62_20E.pdf (Nov. 27, 2012), Annex. The guidelines were accepted by the COPUOS in June 2007 and endorsed by the United Nations in January 2008, UNGA resolution 62/217, available at http://www.oosa.unvienna.org/pdf/gares/ARES_62_217E.pdf. *See generally*, *Space debris: Orbiting Debris threatens sustainable use of outer space*, *available at* http://www.un.org/en/events/tenstories/08/spacedebris.shtml.

[130] *See Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, United Nations Office for Outer Space Affairs, p. iii (Jan. 2010).

Spacefaring States have taken different approaches to implementation of these guidelines.[131] The greatest inconsistency has been how the mitigation standards apply to private sector operators. Fortunately, States that have failed to apply strict debris mitigation standards similarly to both governmental and commercial entities have had very few private launches.[132] Most experts praise inter-governmental guidelines for reducing the growth of new debris until the Chinese ASAT test in 2007.[133]

Before launching new vehicles and satellites into orbit, indeed throughout the process of planning, design, manufacture and operation, attention should be devoted to preventive measures for limiting debris during normal operations and reducing the potential for in-orbit break-ups.[134] Existing guidelines are nonbinding, however, raising concerns about potential noncompliance. How best to oversee compliance with technology and design standards that, whatever their virtues, have not yet been accepted as binding is a policy question that is a step too far for an international court to resolve at this time. Yet, an international court can clarify that each launching State should bear the burden of establishing its good faith efforts to comply with such standards. As it is in the interests of humanity to minimize the risk of new debris, States should satisfy the highest standard of care. Moreover, deliberate disregard of standards for preventing breakups or accidents

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[131] *See generally*, Benjamin Jacobs, *Debris Mitigation Certification and The Commercial Space Industry: A New Weapon in The Fight Against Space Pollution*, 20 MEDIA LAW AND POLICY 117 (2011), *available at* http://www.nyls.edu/user_files/1/3/4/30/84/88/20.1%20Artcle%204%20by%20Jacobs.pdf.

[132] *Id.* As of 2010, the United States (which has nearly similar standards for private launches) had licensed at least 184 commercial satellites, while France operated only two commercial satellites, both in conjunction with Swedish and Belgian entities. Italy, which also was cited as having failed to apply its debris mitigation policies against private operators, has no commercial operators.

[133] Max M. Mutschler, *Risk Governance and Transatlantic Cooperation in Space*, American Institute for Contemporary German Studies, The John Hopkins University (2012), *available at* http://www.aicgs.org/site/wp-content/uploads/2013/01/IB-43-ERP-Space-Risk.pdf.

[134] *See generally*, Committee for the Assessment of NASA's Orbital Debris Programs, *Limiting Future Collision Risk to Spacecraft. An Assessment of NASA's Meteoroid and Orbital Debris Programs* (Washington, DC, 2011).

should be deemed an international wrong against all others, *erga omnes*.[135]

2. Prevention of Debris Post-Service—Proper Disposal

The problem of preventing space debris includes the challenge of disposing of inoperative satellites, launch vehicles and other equipment. Once launched, space equipment will, sooner or later, lose value and become debris. When that happens, the only realistic means for disposing of such debris, currently, is to bring it out of orbit leading to its disintegration in atmospheric re-entry.[136] Other ideas for how to cope with inoperative satellites that do not involve atmospheric re-entry include: (1) refueling in place – a space vehicle will go to the satellite and reinvigorate its operations;[137] (2) lifting the satellite, whether through its own power or from an external source, into a higher orbit;[138] or (3) hurling the satellite outside Earth space, optimally into the sun. For space debris in the most crowded LEO, almost all disposal

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[135] In terms of extant space law, the easiest way to proceed here is for States to amend the 1975 Convention on Registration of Objects Launched into Outer Space. Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention]. The Registration Convention requires registration of all launches to require, as part of the registration process, reporting of how and when the spacecraft will be properly disposed of.

[136] Current post debris mitigation standards differ for LEO and GEO due to the differences inherent to these orbits. LEO post mission debris mitigation changes based on the statutes of individual nations and agencies, but the common thread woven through all parties involved is to limit the time that objects spend in orbit after their mission and the procedures to complete to render the satellite inert from impacts.

[137] DARPA's Phoenix program focuses on re-purposing defunct satellites by sending very small 'satlets' to reuse old equipment. Nano satellites, could be sent to the GEO region more economically as a "ride along" on a commercial satellite launch, and then attached to the antenna of a non-functional cooperating satellite robotically, essentially creating a new space system." *See* Donald Melanson, *DARPA touts progress on Phoenix to salvage dead satellites*, ENGADGET (Jan, 22, 2013), *available at* http://www.engadget.com/2013/01/22/darpa-touts-progress-on-phoenix-program-to-salvage-dead-satellit/, http://www.darpa.mil/Our_Work/TTO/Programs/Phoenix.aspx.

[138] The Federal Communications Commission (FCC) requires movement of satellites in Geosynchronous Earth Orbit19 (GEO) into a graveyard orbit, approximately 300 kilometers farther away from Earth. Several hundred now reside in this dead orbit in order to ensure that they do not interfere with the active satellites at the lower altitudes. Akers, *supra* note 35, *citing* Daniel Engber, *Where Satellites Go When They Die: To a Higher Plane*, SLATE.COM, Apr. 26, 2005, http://www.slate.com/articles/news_and_politics/explainer/2005/04/where_satellites_go_when_they_die.html.

attention is focused on atmospheric disintegration. Thus, the act of launching creates, with the passage of time, the imperative for de-orbiting the detritus.

The technological feat of de-orbiting a satellite for atmospheric disintegration raises various manageable challenges. Any ultra-hazardous or radioactive substances must not reach Earth; such substances should be emitted while the satellite is still outside the atmosphere through a process known as passivation.[139] Also, the de-orbiting process should not risk damage to the satellite that could leave numerous smaller debris objects. There should be total disintegration lest an intermittent shower of debris on Earth becomes intolerable. Re-entry should be targeted such that any surviving debris will scatter over an uninhabited region.[140]

The key here is: whether disposal happens safely, quickly and without causing ancillary harm depends on the capacities built into that equipment when it is launched. By the time that disposal is needed, options for addressing these and other challenges are severely limited. Indeed, the existing space debris nuisance is a clunking manifestation of past human failure to anticipate the need to control the debris that ensues from space activities decades from then. Thus, at the heart of an international legal reme-

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[139] Passivation refers to depleting all latent energy reservoirs of a spacecraft or orbital stage to prevent an accidental post-mission explosion. Passivation includes purging of all chemicals and fuels, all release of all pressurized fluids and gasses, depleting of the electrical system, and deactivation of any mechanical systems. NASA NPR 8715 006A. The ISO 24113 standard instituted by UNCOPOUS mandates that any object below 2000km in altitude remain in orbit for less than 25 years, and if operable at the time of retirement, must go through passivation. [*See generally*, http://www.esa.int/Our_Activities/Operations/Space_Debris/Mitigating_space_debris_generation; and NASA Technical Standard 8719.14, *Process for Limiting Orbital Debris* (Washington D.C., 2012).

[140] The obvious choice for a polar-orbiting orbit is the South Pacific given the relatively north-to-south oriented ground track of the satellite. In any event, the satellite should also be "designed for demise": during the design of spacecraft, preparing the on-ground safety requirements in case of an uncontrolled re-entry, *i.e.*, intentionally designing, assembling, integrating and testing of spacecraft so that the space system will fragment in a desired way during the re-entry and not cause a threat to people or property on Earth. *See* R. Janovsky, *End-of-Life De-Orbiting Strategies for Satellites*, DEUTSCHER LUFT-UND RAUMFAHRTKONGRESS 2002, at 4 [hereinafter Janovsky]. *See also* Timothy Craychee & Shannon Sturtevant, *Mitigating Potential Orbit Debris: The Deorbit of a Commercial Spacecraft*, (2011), *available at* http://www.applieddefense.com/wp-content/uploads/2012/12/2011-Craychee-Mitigating_Potential_Orbit_Debris.pdf.

dy for space debris should be a clarification that States will be legally responsible, not only for avoiding collisions with other spacecraft or Earth, but also for properly disposing of whatever they launch, and capacities for proper disposal must be incorporated into space equipment when launched, not left for when its useful life expires.

The problem is not of engineering but of law. There are international (ISO) guidelines for disposal through atmospheric disintegration; these standards are designed not only to promote safe disposal but also to build capacities for enabling execution of each of these phases into the satellite's design.[141] While the technical complexity of proper disposal is not trivial,[142] the root of this problem is that there are no legal consequences for non-satisfaction of these standards, only potential liability for whatever harm might follow, decades from now, from space debris being improperly disposed of or not disposed of at all. Thus, a legal order must focus on compliance with such standards.

Disposal of inoperative space equipment, however, presents different disincentives than preventing broken satellites. While many spacefaring interests share the goal of minimizing breakage of operational satellites, there is much less incentive to invest substantial resources now in advanced disposal technology so as to ensure that, years hence when the equipment reaches the end of its useful life, it will be properly disposed. From launching entities' perspective, the benefit of satisfying international best practices for space equipment disposal may seem incidental as the risk of future harm from improper disposal of space equipment is neg-

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[141] *See generally*, *Space Systems—Space debris mitigation requirements,* ISO 24113:2011 (Geneva, Switzerland, 2011.

[142] The dead satellite has to have enough fuel to exercise thrust, attitude control, power, and command and telemetry (C&T) capabilities all of which vary depending on the type of de-orbit. The disposal sequence usually consists of several de-orbit burns as breaking up the disposal maneuver allows for accurate orbit determinations, subsequent burn planning, and contingency management. The satellite must continue to be operable in the planned de-orbit attitude, which may be different from that of the normal mission operations. This may require the performance of an unusual maneuver should the spacecraft encounter an anomaly which demands flight control software that is able to gracefully degrade to a more robust, but less capable mode of operation. The implied constraint is that the combination of disposal maneuvers should not reduce the available power of the spacecraft's batteries. *See generally*, Janovsky, *supra* note 140.

ligible. Indeed, it may be competitively advantageous for launchers to deliberately disregard international disposal standards in order to convey an advantage for their own domestic industries. If there are no legal consequences for ignoring standards, any launching State may reasonably believe that space is a gold rush to be mined while possible, and technology for enabling safe disposal is a luxury exclusively for the benefit of later generations.

Thus, there must be legal consequences for any State that deliberately ignores prevailing standards by launching equipment with inadequate technological capacity to facilitate safe disposal at the end of its utility. As earlier discussed, the answer offered by the Outer Space Liability Convention – there is no responsibility unless that debris inflicts actual damage to another spacecraft or Earth due to the launching State's fault – is no answer whatsoever, effectively rubber-stamping total disregard of the space debris condition. But while States certainly can make international law, they cannot by agreement elude their legal obligations. There must be State responsibility for disposal of debris.

The virtue of an ICJ ruling that States must exercise due diligence in complying with their responsibility to ensure eventual proper disposal at the time of launch is to bring their responsibility for preventing future harm to later generations into the present. A launching entity should be held to no higher standard than satisfaction of international disposal standards. States should enjoy the freedom to clarify and improve such disposal standards; international standards should be a floor, not a ceiling. Moreover, standards should be progressive: today's satisfaction of standards will not entail the same technologies tomorrow, and progress is inherent in the standardization process. What States should not have freedom to do, however, is to resist the clarification of such standards and then assert the ambiguity of such standards as a defense for having done too little to enable proper disposal of their space debris.

This requirement needs to allayed by recognition that imposition of common standards will likely adversely impact new entrants (developing nations) in favor of the advanced States who can better bear the substantial expense and have access to technology for enabling proper disposal. Having exclusively caused the

space debris problem, should not advanced States exclusively bear the onus of complying with standards for safe disposal?

It is some answer to this objection to note that, with regard to remediation of existing debris, discussed below, the responsible advanced States bear total responsibility. Moreover, even with regard to prevention of new debris, responsibilities should be *common but differentiated.* This basic principle of international environmental law propounds that while all States share responsibilities, specific obligations to be imposed on individual States may allow for differences due to States' different onus for past wrongs as well as of their capacities for improving the future. In connection with space debris prevention, differences of responsibility could best be addressed by legal arrangements that ease access to proper space debris disposal technology in terms of licensing, financing and training. There are mechanisms for balancing interests that operate as to other areas of the commons areas that may be adapted for sharing access to technology and capital fairly and effectively in addressing space debris.[143]

Most important from international law's perspective is to encourage compliance rather than punish noncompliance. A legal remedy should be encouraging of any entity that willingly and in good faith accepts obligations for undertaking space activities respectful of the imperative against further contributing to the space debris nuisance. Accordingly, an ICJ ruling should guide development of legal mechanisms that foster trans-national cooperation, incentivize investment, and enable access to key technological capacities on a nondiscriminatory basis and in compliance with prevailing rules governing international technology transfer. All prospective obligations – whether prohibitions of certain activities or requirements about how to pursue lawful activities – should be framed to reward positive engagement. This is especially the case with regard to space which, literally, is humanity's ultimate common imagining.

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[143] For a discussion of how the interests of different nations can be reflected in a model for mitigating space debris, see Michael Singer, *An International Environmental Agreement for Space Debris Mitigation Among Asymmetric Nations* (2012), *available at* http://escholarship.org/uc/item/7w5912qm#page-3.

C. Remediation Obligations

To mandate compliance with debris prevention standards is only one facet of a remedy. Space is already fouled by debris that, for whatever reason, cannot fall or be brought into atmospheric disintegration. Indeed, according to an IADC report from 2013, satisfaction of mitigation guidelines may be insufficient for a sustainable LEO environment.[144] Remedies must, therefore, entail cleaning up debris already in space. But this is where application of legal doctrine runs head-on into the realm of science fiction. Even if a court mandated that dead spacecraft be removed from orbit, there is not currently an effective and reasonably cost-effective way to do that. Simply framed, to clean up space debris now and into the future means investing vast sums of capital in technologies that are barely on the horizon.[145]

Most space debris remediation technologies focus on applying an external force to slow down orbital objects so as to cause their atmospheric re-entry and disintegration. Slowing down inoperative objects in space is not technologically easy. An object that cannot be slowed by its own guidance processes must be slowed by a braking force that can come either from a terrestrial source or from another source in space. An example of a terrestrial-based system is NASA's proposal to use lasers that do not damage the

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[144] *Stability of the Future LEO Environment* (IADC, Feb. 2013), *available at* http://www.iadc-online.org/index.cgi?item=docs_pub. For further discussion, see Hubert Foy, *Effectiveness of Post Mission Disposal Rule Could Curtail LEO Debris Creation,* SPACE SAFETY MAGAZINE (October 24, 2012), *available at* http://www.spacesafetymagazine.com/space-debris/debris-removal/effectiveness-postmission-disposal-rule-curtail-creation-debris-leo/.

[145] When Heiner Klinkrad, Head of ESA Space Debris Office was asked by a German reporter at the Sixth European Conference on Space Debris, how much money is needed to address the problem of Space Debris for the next 10 year, he replied, "Anything we decide to do is going to be an expensive solution... but one has to compare the costs of what it takes to solve the problem in the early state compared to losing the infrastructure we have on existing orbits." Mr. Klinkrad went on to explain the costs associated with protecting space craft stating that the average insured value for the 200 insured space craft operated by the ESA is €130 million, which represent only 20% of the ESA's operational spacecraft, and that the cost of a single mission for Active Debris Removal using current technology is no less than €150-200 million. European Space Agency, *Webcast: Concluding Press Conference 6th European Conference on Space Debris*, LIVESTREAM.COM (April 25, 2013), http://www.esa.int/Our_Activities/Operations/Space_Debris/Webcast_Concluding_press_conference_6th_European_Conference_on_Space_Debris.

object, instead hitting them repeatedly with a lower powered energy beam to slow them down so that they de-orbit on their own.[146] This system has some advantages in terms of ease of operation and avoiding the necessity of launching a spacecraft in order to dispose of spacecraft.

Applying a braking force from space – *e.g.*, harpoons, nets or grappling devices—has some advantages in controlling the target object without affecting other objects or risking the object's inadvertent destruction.[147] Recent proposals include releasing gas or foam from a small satellite in the opposite direction of the target object. The cloud would be short-lived but long enough to hit the targeted debris without causing damage.[148] A recent NASA proposal, SpaDE, uses an atmospheric-based device to blast gases into orbit, creating a cloud in which debris objects would pass through, losing much of their velocity and causing them to enter the earth's atmosphere. Major advantages are that this system would not create any more debris even if it failed in its mission, and it would be less expensive than sending something into orbit to collect debris.

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[146] Claude R. Phipps *et al, Removing Orbital Debris with Lasers*, at 2-2 (Photonic Associates, LLC., Santa Fe, MN., 2009) *available at* http://arxiv.org/ftp/arxiv/papers/1110/1110.3835.pdf; *see also NASA Studies Laser for Removing Space Junk*, (Mar. 14, 2011), *available at* http://www.technologyreview.com/view/423302/nasa-studies-laser-for-removing-space-junk/. The AVS Lab at the University of Colorado has proposed a variant of this idea that would partially disable the target spacecraft, *Active Debris Removal*, *available at* http://hanspeterschaub.info/research-ADR.html.

[147] *See generally,* Christophe Bonnal, *Active Debris Removal: Current Status of Activities in CNES* (2013). *See also*, Charlotte Lucking, *A Passive High Altitude Deorbiting Strategy* (2011), *available at* http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1155&context=smallsat&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fstart%3D10%26q%3Ddeorbit%2Banalysis%26hl%3Den%26as_sdt%3D0%2C14%26as_ylo%3D2011%26as_yhi%3D2011#search=%22deorbit%20analysis%22.

[148] *See* Andrenucci *et al.*, *Foam-based Active Space Debris Removal Method* (June 10, 2011), *available at* http://www.esa.int/gsp/ACT/doc/EVENTS/ACT-PRE-1106-Pisa-ADR-Foam-Executive_Presentation_A_Ruggiero.pdf; *Boeing Proposes Gas Clouds To Remove Space Debris,* SPACE MART (Oct. 16, 2012), *available at* http://www.spacemart.com/reports/Boeing_Proposes_Gas_Clouds_to_Remove_Space_Debris_999.html. *See also* Jesse R. Quinlan, *A Preliminary Systems-Level Analysis of Candidate Active Space Debris Removal Architectures*, AIAA Space 2011 Conference & Exposition, AIAA 2011-7250, *available at* http://people.virginia.edu/~jrq2a/papers/aas11.pdf.

Notably, however, all these technologies that are useful for slowing down space equipment so that it falls from orbit could also be used as a weapon to disable or de-orbit other States' functioning satellites. From this perspective, weaponization of space could escalate under the guise of space debris removal efforts, raising substantial concerns for international peace and security.[149] As space has long been feared to be the next and potentially gravest theatre of war, and as international space law's most fundamental mission is to sustain humanity's use of space exclusively for peaceful purposes, enabling technologies for de-orbiting and disintegrating space objects raises troubling implications. If technology can cause a dead satellite to de-orbit, what is to prevent that technology from being used to cause a live satellite to de-orbit? The capacity to de-orbit is the capacity to destroy, and as long as only a few States have the capacity to de-orbit other spacecraft, then issues of international peace and security must be implicated.

It is significant, therefore, that the Swiss Space Center recently announced plans to develop and launch a satellite which will rendezvous with its target, extend a grappling arm to grab it thereby causing both objects to slow down sufficiently to plunge to atmospheric disintegration.[150] Switzerland's historical neutral status might mitigate concerns that it will be used for hostile purposes, and performance of such a maneuver could establish a customary norm that a nation may de-orbit a derelict space object through the use of another space object without raising other States' fears. [151] Yet, this system works only for large objects, and the cost (one grabbing vehicle per target debris object) is likely to be exorbitant for cleaning u vast quantities of debris in lower earth orbits.

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[149] *See* David A. Koplow, *An Inference About Interference: A Surprising Application of Existing International Law to Inhibit Anti-Satellite Weapons,* 35 U. PA. J. INT'L L. 737-827 (2014). *See also* Michael J. Novin, *Satellite End-of-Life Considerations, Requirements, and Analysis* ASE 5050 (CAETE), Dec. 20, 2008, *available at* http://ccar.colorado.edu/asen5050/projects/projects_2007/novin/; Jackson Nyanuya Maogot & Steven Freeland, *Space Weaponization and the United Nations Charter Regime on Force: A Thick Legal Fog or a Receding Mist*, 41 INT'L LAW. 1091 (2007).

[150] Michael J. Listrier, *Swiss Open Political Door for Space Debris Removal*, SPACE SAFETY MAGAZINE, Feb. 20, 2012, *available at* http://www.spacesafetymagazine.com /2012/02/20/swiss-space-debris-effort-open-political-door-space-debris-removal/.

[151] *Id.*

More broadly viewed, there is a compelling need at this time, and foreseeably, to stimulate State and private innovation of safe and peaceful space debris removal technologies in service of a *humanity-wide endeavor*.[152] Space debris disposal is extremely expensive, and there are not likely to be many options for doing it effectively. Leaving to individual spacefaring States the task of developing effective removal technology seems suboptimal as each State has scant incentive to bear the substantial costs of removing its own equipment, much less that of any other States.

The core of the legal remedy for space debris remediation should be, therefore, capitalization by all nuisance-contributing parties (all spacefaring States) of debris removal capacities for humanity's benefit. The law's object, albeit not to punish, must be to enable remediation. In legal terms, the "polluter pays principle" must mean that, in the end, the polluters pay. As the victimized complainant is humanity, the "payment" should be to enable humanity's interests to recover from the nuisance.

Responsibility in this context must mean capitalization of a Fund for developing international capacities for removing debris from orbit and safe disposal. As there can be no realistic expectation of cleaning up space in the immediate future, the Fund should be set at a level to enable technological progress toward eventual debris removal.[153] Each spacefaring State should be required to pay its pro rata share of responsibility in proportion to its contribution to the space debris nuisance. The accounting complexities of executing this obligation, while substantial, are not outside the experience of courts that often deal with complex allocations of liability.[154] A simple baseline could be the State's share

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[152] Experts have advocated an orbital maintenance fund, funded by a space access fee that could finance the technologies necessary to clean the debris from orbital space citing various environmental remediation regimes. Akers, *supra* note 35, *citing* Mark Williamson, SPACE: THE FRAGILE FRONTIER 270 (2006). Any such fee, however, would be forward looking and says nothing about responsibility for previous conduct.

[153] *See generally*, Brian C. Weeden & Tiffany Chow, *Developing a Framework and Potential Policies for Space Sustainability Based on Sustainable Management of Common-Pool Resources*, JAC-10.E3.4.3, *available at* http://swfound.org/media/50234/IAC-11.E3.4.3-Paper.pdf.

[154] An analogy can be drawn to the law of salvage responsibility and compensation which is, comparably to space debris, based on the need to encourage commercial activity by reducing hazards and to reward persons who conduct rescue efforts. *See generally*, Note, *Calculating and Allocating Salvage Liability*, 99 HARV. L. REV. 1896 (1986).

of the total number of orbital launches, which would mean that Russia, the United States, and the European Union would bear the lion's share of financial responsibility.

Important questions concerning calculation of a common baseline have to do with whether to exclude some types of launches (*e.g.*, of spacecraft launched to depart Earth space and therefore do not clutter orbits) and whether to weigh more heavily recent over older launches in recognition that there has been growing understanding of the space debris problem. According to the ILC, weight should be given to the availability of means of preventing such harm or minimizing risks,[155] which could argue for weighting recent launches more heavily. Consideration should also be given to the importance of activity for each State in relation to the potential harm to the environment. These are all factors to be considered in apportioning responsibility for the Fund.

More important questions have to do with the governance of the Fund. Clearly, the specifications of compliance standards, the mechanisms of recordkeeping and reporting, and a host of other enforcement obligations are better fleshed out through international diplomatic processes. Moreover, there are pivotal secondary questions of how the costs and benefits of such a massive undertaking will be shared among all participants and about building capacity for new participants, and there are questions about how all this will be governed. Indeed, it is at this point that judicial resolution of the problem of space debris must give way to resolution by global policy makers.

CONCLUSION

The issue of legal responsibility for preventing and remediating space debris raises wholly novel challenges – a problem of this precise character and magnitude has never before faced humanity. Space debris inherently must be addressed by humanity; the traditional precepts of *the law of nations,* which limits the only dimension of international law to the inter-state pursuit of mutual interests, cannot successfully cope with this type of problem. To the contrary, the protection of present and future generations, and the very survival of humanity, require proper responses with the

[155] ILC Prevention, *supra* note 64, art.10.

mobilization of all subjects of international law.[156] Challenges of this magnitude "call for special attention and world-wide cooperation, with the corresponding rights and duties pertaining to present and future generations, bearing in mind the needs and aspirations of humanity."[157]

It may be readily admitted that design of a regime for cleaning up space debris is a matter of intricate policy, more appropriately achieved by consensus leadership of all spacefaring States. There are models of such leadership from the Whaling Convention, to the Antarctica Convention, to the Montreal Protocol. Countless questions call out for resolution through diplomatic progress that ensconces humanity's interests into a binding international system for cleaning up space debris.

In the meantime, resort to judicial resolution of this problem would be useful.

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[156] According to Professor Trindade: "under the concept of common heritage of humanity, there existed a universal solidarity not only in space (among peoples) but also in time (among successive generations). … Thus, each generation is at a time user and guardian of our common natural and cultural heritage, and should thus leave it to future generations in no worse conditions than it received it. Hence the principle of intergenerational equity … as well as the need to protect systems of sustainability of life, ecological processes, environmental conditions and cultural resources necessary to the survival of humanity, and the need to preserve a healthy human environment." TRINDADE, *supra* note 75, at 328.

[157] *Id.* at 327.

ASTEROID LEGAL REGIME: TIME FOR A CHANGE?

Paul B. Larsen[*]

I. INTRODUCTION

Several outer space businesses have been and are being established for the purpose of extracting mineral riches from asteroids and bringing them to Earth. Views are divided on whether asteroid mining will be economically feasible.[1] Budding asteroid mining enterprises, such as Planetary Resources, [2] maintain that the technology for exploitation of asteroids now exists and that it is just a question of converting it for commercial uses and obtaining financing. The goal is to locate asteroids containing precious metals such as gold or platinum.

Secondly, there are several current government initiatives to explore asteroids. In his 2010 White House Space Policy State-

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[1] Roger G. Harrison, *Belaboring the Obvious*, and Dennis Wingo, *The Inevitability of Extraterrestrial Mining* 15 SPACE NEWS, July 29, 2013. Launching a spacecraft for asteroid mining costs hundreds of millions of dollars and launch costs would have to decrease drastically for the project to be profitable. No one has experience with asteroid mining. The learning curve will be steep and expensive; *see* MICROCOM www.spacenewsfeed.co.uk/index.phl/asteroids/15280.

[2] One such start-up enterprise is Planetary Resources located in Bellevue in the U.S. State of Washington. The leaders of the company are present and former high tech executives of NASA and Google. In the short term, they intend to develop technology, primarily orbital telescopes, in space to locate suitable asteroids as well as actual asteroid mining tools. In the longer term, they expect to engage in actual mining within the next decade. *See* Kirk Johnson, *A Start-up Sees a Gold Rush Among the Stars*, N.Y. TIMES, December 25, 2012, at A12.

ment,[3] the U.S. President directed NASA to send astronauts beyond the Moon by 2025. To further that objective, NASA is currently developing a new launch rocket with a crew capsule. NASA proposes to capture an asteroid, remove it from its existing solar orbit, and move it into a lunar orbit for further examination. NASA plans to launch the rocket with astronauts by 2021. NASA considers that this experiment will also benefit potential asteroid mining enterprises.[4] The European Space Agency (ESA) is considering whether to join the NASA project.[5]

A third possible national or multinational outer space activity concerns asteroids that threaten the Earth, known as Near Earth Objects (NEOs). The destructive potential of NEOs was dramatically illustrated by the explosion of an NEO over Chelyabinsk, Russia, on February 15, 2013.[6] The UN Committee for the Peaceful Uses of Outer Space (COPUOS) is exploring possible joint activities mainly focused on linking national asteroid observation facilities in order to coordinate a count of, and to monitor, threatening NEOs. The next step will be to organize and coordinate joint action regarding NEOs threatening Earth.[7] To divert NEOs from colliding with the Earth, such action would involve control and diversion from the orbit of NEOs by impacting it with an Earth-launched object, and possibly a nuclear explosion.[8]

These public and private asteroid initiatives are beginning to merge. NASA's plan to capture an asteroid is considered a valua-

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[3] National Space Policy of the United States of America, June 28, 2010, at 11, www.gps.gov/policy/docs/2010/ [hereinafter National Space Policy].

[4] NASA robots would capture an appropriate asteroid, Subsequently two astronauts on an Orion spacecraft would arrive to examine the asteroid, Houston, *How to Catch an Asteroid*, AVIATION WEEK AND SPACE TECHNOLOGY, Dec. 9, 2013, at 48.
Kenneth Chang, *Plan to Capture an Asteroid Runs Into Politics*, N.Y. TIMES, July 30, 2013, at D1, http://www.nytimes.com/2013/07/30/science/space/plan-to-capture-an-asteroid-runs-into-politics.html?pagewanted%253Dall&_r=0.

[5] AVIATION WEEK, July 1, 2013 at 10.

[6] *Defenders of the Earth*. THE ECONOMIST, June 29, 2013, at 13.

[7] United Nations, Committee on the Peaceful Uses of Outer Space [COPUOS]; Report of the Scientific and Technical Subcommittee on its fiftieth secession, held in Vienna from 11 to 22 February 2013, U.N. Doc. A/AC.105/1038 (1969).

[8] Leonard David, *United Nations Action Team Reviewing Asteroid Impact Threat*, SPACE NEWS, Feb. 25, 2013, at 14. *See also, Defenders of the Earth, supr*a note 6. Justin Koplow suggests use of airborne lasers, *see* Justin l. Koplow. *Assessing the Creation of a Duty under International Customary Law Whereby the United States of America Would be Obligated to Defend a Foreign State Against the Catastrophic but Localized Damage of an Asteroid Impact*, 17 GEO INT. ENV. L. REV. 273 (2004-05).

ble experiment in planning for a possible diversion of an NEO. NASA has also entered into a partnership arrangement with Planetary Resources to coordinate their asteroid activities. [9]

A legal regime for dealing with asteroids is urgent. This paper will first examine existing space law before considering possible future regimes that could facilitate asteroid-based activities.

II. EXISTING INTERNATIONAL SPACE LAW OF ASTEROIDS

A. The Outer Space Treaty

The Outer Space Treaty applies to "celestial bodies" in outer space. Does that include asteroids? A threshold issue is whether an asteroid is a celestial body under the Treaty. The Treaty does not define celestial bodies. In the absence of a specific definition, the first rule of treaty interpretation is to look for the ordinary meaning of its terms.[10] The Wikipedia encyclopedia definition is helpful in explaining the ordinary meaning of the term "celestial bodies". It states:[11]

> Astronomical objects or celestial objects are naturally occurring physical entities, associations or structures that current science has demonstrated to exist in the observable universe. The term astronomical object is sometimes used interchangeably with astronomical body. Typically, an astronomical (celestial) body refers to a single, cohesive structure that is bound together by gravity (and sometimes by electromag-

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[9] Chang, *supra* note 4. On November 21, 2013, NASA entered into partnership with Planetary Resources to enhance detection of NEOS as well as to utilize asteroid resources. *See* http://www.spacenewsfeed.co.uk/index.php/asteroids/16124-nasa-planetary-resources-sign-agreement-to-crowdsource-asteroid-detection.

[10] Vienna Convention on the Law of Treaties, art. 31, opened for signature May 23, 1969 1155 U.N.T.S. 331 (entry into force Jan. 27, 1980) (hereinafter Vienna Convention).

[11] *See* https://en.wikipedia.org/wiki/Astronomical_object, which references Int'l Astronomical Union, Naming Astronomical Objects, at http://www.iau.org /public/themes/naming/. The World Book Encyclopedia, Vol. 13, at 432 states that many asteroids turn into meteorites striking the surface of the Earth. Some meteorites are chondrites which consist of the materials which originally formed the planets, including the Earth. The magnitude of a meteor strike is exemplified by the Meteor Crater in Arizona, which was caused only 50,000 years ago by a large meteor. The crater is 4,180 ft. wide and 570 ft. deep.

> netism). Examples include the asteroids, moons, planets and the stars. (Emphasis added)

Initially, it must be clarified that the discussion in this paper concerns asteroids located in outer space. Remnants of asteroids that have landed on Earth are no longer asteroids. They become meteorites when they land on Earth and as such are subject to the national property laws of the State in which they land. Both the Outer Space Treaty and the Moon Agreement [12] expressly apply in outer space. Specifically, the Moon Agreement, Art 1(3) states "This Agreement does not apply to extraterrestrial materials which reach the surface of the Earth by natural means." [13] As Fasan points out, this is the only (although indirect) reference to asteroids in international space law. It leads him to the conclusion that asteroids in outer space are subject to the space law treaties.[14]

Another curious implication of the Moon Agreement's exception for asteroids reaching the Earth by natural means is that international space law might also apply to asteroids brought to the surface of the Earth by artificial means by a mining company or by NASA. The Outer Space Treaty is silent on its application to asteroids brought to the surface of the earth's surface by artificial means, but the Treaty does not preclude its application. On the other hand, national laws regulate property rights to meteorites

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[12] The five public space law treaties originate in the COPUOS. They are: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *open for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty]; Agreement on Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue and Return Agreement]; Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 691 U.N.T.S. 18 [hereinafter Liability Convention]; Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1974, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention]; and Agreement Governing Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 21[hereinafter Moon Agreement]. All these treaties are in force. All, except the Moon Agreement are widely adopted. The Moon Agreement has only 15 parties, per UNODA, and none of the major space powers have ratified it.

[13] *Id*.

[14] Ernst Fasan, *Asteroids and other Celestial Bodies – Some Legal Differences*, 26 J. SPACE L. 33 (1998).

found on Earth.[15] That indicates State practice for applying the Outer Space Treaty.[16]

Travaux preparatoires are also important in treaty interpretation.[17] Reference to 'celestial bodies' was made in the 1963 UNGA Declaration of Legal Principles.[18] The 1962 draft proposals for the Declaration by United Kingdom, the United States, and the then-USSR all used the term.[19]

The 1966 draft proposal of the United States[20] contained an 'Outline of Points for Inclusion in Celestial Bodies Treaty.' Attached was a draft Treaty Governing the Exploration of the Moon and other Celestial Bodies. It is interesting that this early draft tended to refer broadly to 'celestial bodies' rather than to the 'Moon and celestial bodies.' The drafting Parties used the broader term 'celestial bodies' to describe and include all bodies in outer space including planets and asteroids. References to the all-inclusiveness of celestial bodies remain in the Treaty. For example, the Outer Space Treaty, Art IV, second paragraph, states that

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[15] United States v. One Lucite Ball Containing Lunar Material (One Moon Rock) and One Ten Inch by Fourteen Inch Wooden Plaque, 25 F. Supp. 2d. 1367 (S.D. Fla. 2003)[hereinafter One Ten Inch wooden Plaque] illustrates the application of national law to an outer space object on the surface of hearth. A gram of lunar material brought to the Earth by US astronauts was donated to the government of Honduras by President Nixon. The small object had somehow come into the possession of a private citizen of Honduras, who sold it to a US citizen. NASA discovered the transfer and the US government brought action to recover the item on the reasoning that title had not and could not pass to the U.S. citizen because it belonged to Honduras. The court agreed that the item belonged to Honduras because the law of Honduras prohibited transfer of the item. The case is pertinent and relevant to the discussion of applicable law holding that national law applies to the issue of ownership of an outer space item located on the surface of the Earth. *See also* Moon Agreement, *supra* note 12, at art 6(2) (stating that States may collect samples of lunar minerals and other substances for scientific purposes).

[16] Vienna Convention, *supra* note 10, at art. 31.

[17] *Id*. at art. 32.

[18] Declaration of States in the Exploration and Use of Outer Space, G. A. Res. 1962 (XVIII), U.N. GAOR, 18th Sess., 1280th plan. Mtg., U.N. Doc. A/RES/1962 (XVIII) (Dec. 13, 1963).

[19] A/C1/879, 12 Oct. 1962, A/C1/881, 14 Oct. 1962, and A/AC.195/c.2/L.6. 16 April A/C1881. The Outer Space Treaty to a large extent replicates the 1963 UNGA Resolution. Presumably the drafters of the Outer Space Treaty had the same interpretation of 'celestial bodies' in mind.

[20] A/AC/105/32, 17 June 1966.

"conduct of military maneuvers on celestial bodies shall be forbidden." [21] Thus, it prohibits military activities on asteroids.

There are many references to celestial bodies in the Outer Space Treaty. The following discussion will proceed on the basis that an asteroid is a celestial body. There is no specific carve-out of asteroids from the Treaty. It should be noted, however, that Fasan is of the view that while asteroids are celestial bodies, he "deems Asteroids not as Celestial Bodies in a legal sense." [22] However, other space lawyers do not find evidence that the drafters of the Outer Space Treaty intended to exclude asteroids from application of the Treaty to all celestial bodies.[23] Whether or not the Outer Space Treaty applies to asteroids is of course fundamental to their legal regime. Fasan, one of the fathers of space law, is right in his basic judgment that asteroids do not fit well under the legal regime of the Outer Space Treaty and his judgment is a strong motivation for his search for alternatives. The Outer Space Treaty reflects the understanding and technology that existed in 1967. Its mentality reflects the particular cold war competition between the two space powers, Russia and the United States, and the predominance of these two States in drafting the Outer Space Treaty.

Fasan ultimately suggest that we should wait to resolve the legal question of applicable law to such future time when urgencies, particularly urgent threats to Earth by NEOs, require resolution of this legal question.[24] However, such a waiting period could result in uncertainty and possible chaos.[25] Alternatively, he urges definition of what is meant by 'celestial bodies' in the space law treaties and other legal instruments. [26]

Importantly, the Antarctic Treaty[27] is considered the model for the Outer Space Treaty. It is considered relevant travaux *pre-*

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[21] Outer Space Treaty, *supra* note 12.

[22] Fasan, *supra* note 14.

[23] *Id. See* FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE, 179 (Ashgate 2009).

[24] Fasan, *supra* note 14, at 40.

[25] See further on the consequences of legal uncertainty below in section V (B) Recommendations. *See also* LYALL & LARSEN, s*upr*a note 23, at 196-197.

[26] Fasan, *supra* note 14, at 40.

[27] The Antarctic Treaty opened for signature Dec. 1, 1959,12 U.S.T. 794, 402 U.N.T.S. 71 (entry into force June 23, 1961) [hereinafter Antarctic Treaty]. President Eisenhower resolved to avoid another Pearl Harbor type surprise attack on the United

paratoire and is important in construing the law on asteroids. The Antarctic Treaty[28] declares that no national activities on Antarctica can result in appropriation subject to national sovereignty, thus implying that asteroids and other celestial bodies cannot be appropriated. This legal principle is restated in the Outer Space Treaty, Article I, providing that celestial bodies "shall be the province of all mankind." Article I further provides that use of celestial bodies shall be for the benefit of all countries. [29]

Article 1[30] obligates States to cooperate with each other in their uses of outer space. This obligation flows from the individual states on to their non-governmental operators. Furthermore, Article I provides that celestial bodies shall be used "for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." All celestial bodies "shall be free for exploitation and use by all States without discrimination of any kind, on the basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies."[31]

Article 1 expresses the attitude of the developing countries in the drafting and formation of the Outer Space Treaty.[32] Those countries realized that the then-two space powers, the United States and the USSR, monopolized the technology to explore and exploit outer space resources. The developing countries wanted to preserve those resources intact as much as possible until such fu-

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States from outer space. He wanted to remove outer space from military rivalries; *see* DELBERT R. TERRILL JR., THE AIR FORCE ROLE IN DEVELOPING INTERNATIONAL OUTER SPACE LAW, AIR FORCE HISTORY (Air University Press 1999). Consequently, he opted for transparency and 'open skies'.

[28] Antarctic Treaty, *supra* note 27. The Treaty establishes freedom of scientific investigation. Analogous to the Outer Space Treaty, the Antarctic Treaty does not mention possibility of mining.

[29] Outer Space Treaty, *supra* note 12.

[30] *Id*.

[31] *Id*. The US Delegate to the diplomatic conference reports that the word "use" in Article I includes extraction of minerals, Paul G. Dembling & Daniel M. Aaron, *The Evolution of the Outer Space Treaty*,33 J. AIR. L. & COM.419, At 431 (1967). *See Frank* Morring, Post-ISS Orbital Outposts Taking Shape, AVIATION WEEK AND SPACE TECHNOLOGY, Sept. 30, 2013, at 24 (Vice President Li Yuanchao of China speech to the 2013 Space Congress "All countries are entitled to the equal right to share the resources in outer space."). *See also* Nandasiri Jasentuliyana, *Article I of the Outer Space Treaty Revisited*, 17 J. SPACE L. 129, 141 (1989).

[32] Jasentuliyana, *supra* note 31.

ture time as they could acquire outer space technology. Thus, they conditioned their agreement to the Outer Space Treaty on a bargain in which they denied the developed countries the right to appropriate those resources. This bargain is reflected not only in Article I but also in all the other articles of the Outer Space Treaty, in particular Art. II, which is fundamental to the exploitation of asteroids.[33] Art. II states that: "outer space… is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[34] The prohibition on claim of sovereignty and appropriation of asteroids by any means follows the context established in Art. I, that is, asteroids must be used for the benefit of all mankind. Art. II is all-inclusive. It literally can be interpreted to exclude unilateral control of asteroids. The reason for this drastic regime is that the Outer Space Treaty was negotiated during the space race between the United States and the then-USSR. Both States prepared to go to the Moon. Whoever arrived there first could claim sovereignty and might thus gain a military advantage and could exclude other states. Because of the uncertainty attached to lunar landing, the two space powers agreed to accept the legal principle proposed by US President Eisenhower in his 1960 speech to the UNGA,[35] that is, to follow the precedent of the Antarctic Treaty rejecting the possibility of further appropriation and claim of sovereignty, and agreeing that celestial bodies are not to be appropriated by any one nation or individual.[36] Thus, the Antarctic Treaty precedent continues to be of fundamental significance to understanding the Outer Space Treaty. The bargain struck by the space powers was strongly supported by the developing countries as being in their interest because it assured their future interests in outer space.

Article II raises the question whether States and private companies and individual persons can obtain title to asteroids or parts of asteroids. On that issue, Bin Cheng states that:[37]

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[33] LYALL & LARSEN, *supra* note 23, at 59 – 65.

[34] *Id*. Note also US National Space Policy Statement, *supra* note 3 (stating "As established by international law, there shall be no national claims of sovereignty over outer space or any celestial bodies.").

[35] TERRILL, *supr*a note 27.

[36] LYALL & LARSEN, *supra* note 23, at 55 -56 & 64.

[37] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 233 (Oxford: Clarendon Press, 1997).

> [I]n as much as there is no territorial jurisdiction, there can be no private ownership of parts of outer space or celestial bodies, which presupposes the existence of a territorial sovereign itself competent to confer titles of such ownership. In this sense, outer space and celestial bodies are not only not subject to national appropriation, but also not subject to appropriation under private law.

Consequently, Cheng concludes that further development of regulation will be necessary for private ownership to exist. In his view, the Outer Space Treaty made outer space *res extra commercium (*areas not subject to national appropriation). However, he also believes that Art. II does not preclude exploitation of resources. He thinks that resources in non-sovereign space can be harvested just as fish can be caught on the non-sovereign high seas and then sold in home ports. In other words, he believes that territorial resources can be delivered and sold to customers on Earth. He would permit exploitation of and removal of celestial resources because Art. I provides freedom of access. Other than this exception, exploitation would be subject to the rules of the Outer Space Treaty.

Bin Cheng accepts that other space law scholars do not necessarily agree with his views on exploitation and that the purpose of the Moon Agreement is to resolve the issue of legal right to exploitation.[38] The Board of the International Institute of Space Law (IISL), which is the professional organization of space lawyers, states that there is no territorial jurisdiction in outer space. IISL concludes that private ownership by governmental or by non-governmental entities is therefore not legally possible. The IISL likewise urges adoption of a legal regime on exploitation of outer space resources. [39]

The Vienna Convention on the Law of Treaties provides that expressed treaty intentions must prevail.[40] The intentions of the

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[38] *Id.*

[39] Statement by the Board of Directors of the International Institute of Space Law On Claims to Property Rights Regarding the Moon and Other Celestial Bodies (2004), http://www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf [hereinafter IISL Statement].

[40] Vienna Convention, supra note 10, at art. 31(1) ("A treaty shall be interpreted In good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.").

drafters of the Outer Space Treaty regarding Art. II, were expressed during the negotiations of the Outer Space Treaty by the Belgian representative who stated "the term non-appropriation was advanced by several delegations – apparently without contradiction – as covering both the establishment of sovereignty and the creation of titles to property in private law."[41] Other delegates expressed similar sentiments[42] indicating the intentions of the treaty drafters on the issue of appropriation of asteroids by nongovernmental entities. The US representative, Paul Dembling, confirms that the reference in Art. II to appropriation "refers to the ban on assertion of national claims by way of any human activity in outer space or on the moon or other celestial bodies."[43]

Property ownership to an asteroid is the most fundamental issue raised by the Outer Space Treaty. Art. II, implemented by Art. VI,[44] leaves no doubt that a nongovernmental enterprise cannot obtain property ownership to an asteroid in outer space. It follows that the various entrepreneurs who purport to sell title to a celestial body cannot and do not transfer any sort of legal title to 'purchasers' from them.[45] In that regard, Lyall and Larsen state:

> It is argued that the terms of Art. II of the OST prohibits only claims by states, therefore leaving open the possibility of a claim by an individual, and that such a claim creates a title which can then be passed on to a purchaser. We disagree. A valid right of property to immoveable estate can exist only with a legal system established by a state and in relation to property over which the state has sovereignty. Since state claims to sovereignty in space cannot exist, neither can title to immoveable property on celestial bodies in space.[46]

The example of the claim by Gregory Nemitz to the Asteroid 433 Eros is in point. Mr. Nemitz had registered claim of title to this asteroid. A NASA spacecraft landed on the asteroid. Mr.

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[41] NANDASIRI JASENTULIYANA AND ROY S. K. LEE, III MANUAL ON SPACE LAW 65 (Oceana Publications 1981).

[42] *Id*. at 72.

[43] Paul G. Dembling, *Treaty on Principles Governing the Activities of States on the Exploration and Use of Outer Space Including the Moon and Celestial Bodies*, *in id.* at vol. I, 1.

[44] Outer Space Treaty, *supra* note 12.

[45] LYALL & LARSEN, *supra* note 23, at 184 – 185.

[46] *Id*.

Nemitz sent NASA a bill for parking on his asteroid. NASA declined to pay because the Outer Space Treaty does not permit private ownership of celestial bodies. Because the Nemitz claim raised an issue of interpretation of the Outer Space Treaty, NASA referred Mr. Nemitz to the U.S. Department of State regarding application of the Treaty. He had no better success there. Mr. Nemitz subsequently brought a lawsuit in Federal Court to enforce his claim. The Federal Court of Appeals for the Ninth Circuit declined to recognize his claim on the basis of his failure to state a cause of action. [47]

In view of the above discussion, nongovernmental enterprises cannot exploit and appropriate title to asteroids in outer space. It is likewise subject to dispute whether NASA or any of the other governments contemplating seizure of an asteroid for the purpose of its removal to a lunar orbit could be in compliance with the Outer Space Treaty, without further international action. Seizure of an asteroid would equate with an appropriation. Diverting NEOs from their natural orbits to save Earth would also constitute control amounting to appropriation of celestial bodies. Further, international action authorizing such appropriation would be necessary.

Article II is strengthened by Art. III. It provides that activities of states on celestial bodies shall be in accordance with international law, including the U.N. Charter, for the purpose of "maintaining international peace and security and promoting international cooperation and understanding," thus indicating the interests of States in preserving peace and of national security in outer space. Article III introduces a range of environmental, national security, and other international laws into the outer space arena and thus applicable to asteroids. [48]

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[47] Gregory Nemitz v. United States, CV-N0300599-HDM; 2005 U.S. App.LEXIS 2350 (D. Nev. April 26, 2004) aff'd No.04-16223, slip op. (9th Cir. 2005). *See* Kelly M. Zullo, *The Need to Clarify the Status of Property Rights in International Space Law*, 90 GEO. L.J. 2413 (2002).

[48] Outer Space Treaty, *supra* note 12. Application of the UN Charter raises the interesting question of at what point in time do asteroids fall into the category of non-self-governing territories and thus subject to the UN Charter, Art. 74, under which U.N. Members agree to "due account being taken of the interests and well-being of the rest of the world, in social, economic, and commercial matters."

One of those laws is the very first international space law, the 1963 Nuclear Test Ban Treaty. It is important because of the possible use of nuclear explosions to divert an Earth-threatening NEO. The Treaty is almost universally adopted. The main space powers, including the United States and Russia are parties. In its Art. I, they agreed "to prohibit, to prevent, and not to carry out any nuclear weapons test explosion, or any other nuclear explosion, at any place under its jurisdiction or control." The Nuclear Test Ban Treaty specifically applies in outer space. In its Art. II, the Parties likewise prohibited nuclear explosions "in any other environment if such explosions causes radioactive debris to be present outside the extraterritorial limits of the State under whose jurisdiction or control such explosion is conducted." Consequently, the Test Ban Treaty severely limits use of nuclear explosions to divert NEOs.[49]

The objective of peace in outer space is further emphasized by the Outer Space Treaty's Article IV stating that celestial bodies shall be used "exclusively for peaceful purposes." Article IV explicitly provides that celestial bodies shall be used "exclusively for peaceful purposes." This provision applies to all celestial bodies, therefore including asteroids.[50]

Article VI[51] is fundamental for governmental and for private nongovernmental space enterprises because it provides States access to asteroids in outer space subject to the legal principles of the Outer Space Treaty. Article VI mandates that:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall re-

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[49] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, *opened for signature* Aug. 5, 1963, 14 U.S.T. 1313, 480 U.N.T.S. 43, TIAS 5433 [hereinafter Test Ban Treaty].

[50] BIN CHENG, *supra* note 37, at 651.

[51] Outer Space Treaty, *supra* note 12.

quire authorization and continuing supervision by the appropriate State Party to the Treaty.

The import of Art. VI is to hold private non-governmental enterprises to the same standard as governmental entities. The second sentence of the above quotation prohibits private unregulated activities by private enterprises in outer space and on celestial bodies, such as asteroids.[52] The mechanism for application and enforcement of the Outer Space Treaty principles to non-governmental entities is the national administrative process of authorizing and licensing private non-governmental activities in outer space. Licenses must accord with the Outer Space Treaty. In the United States, this licensing process is administered by the Federal Aviation Administration (FAA) pursuant to the Commercial Space Launch Act,[53] as well as by other agencies. Failure of the United States to enforce the Outer Space Treaty would leave the United States liable for breach of treaty obligations under international law.[54] It would also lead to uncertainty and chaos in outer space.

Very important for authorized non-governmental enterprises is the Outer Space Treaty, Article VIII,[55] stating: "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object and over any personnel thereof, while in outer space or on a celestial body." This means that States shall exercise continuing jurisdiction over their governmental and authorized non-governmental space objects during their activities in outer space. This is a fur-

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[52] *See* Dembling, *supra* note 43, at 17. Dembling, then NASA General Counsel, was U.S. Delegate to the negotiations of the Outer Space Treaty. Likewise, *see The Evolution of the Outer Space Treaty supra* note 31. The second sentence of Article VI would prohibit, as a matter of treaty obligation, strictly private, unregulated activity in outer space or on celestial bodies even at a time when such private activity becomes most common-place. *See also* IISL Statement, *supra* note 39.

[53] U.S. Commercial Space Launch Act, 51 U.S.C. §§50901-50923 (2010), formerly 49 U.S.C. 70101 et seq. *See also* the UNOOSA national space law database at http://www.unoosa.org/unoosa/en/SpaceLaw/national/State-index.html.

[54] Vienna Convention, s*upra* note 10, at art. 60, Termination or suspension of the operation of a treaty as a consequence of its breach. Note also Restatement (Third) of the Foreign Relations Law of the United States §335(1); Comment e (1987), stating that an aggrieved party may seek damages for breach of treaty.

[55] Outer Space Treaty, *supr*a note 12.

ther means for States to hold their non-governmental enterprises to the legal principles of the Outer Space Treaty.[56]

Outer Space Treaty, Article IX,[57] imposes environmental restrictions on non-governmental space enterprises. (1) They must conduct their activities "with due regard to the corresponding interests of all other States Parties to the Treaty." (2) They must avoid "harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter." (3) If a State's outer space activities on asteroids "would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it [the State Party] shall undertake appropriate international consultations before proceeding with any such activity or experiment."

In planning activities that may cause environmental harm to outer space and celestial bodies such as asteroids, the planners are required to weigh seriously the environmental outcome of their activities. Like mining on Earth, asteroid mining may cause harmful contamination and may affect the outer space environment adversely. The Precautionary Principle requires participants to examine potential outcomes seriously and to stop and engage in more intensive outcome examination if the environmental outcome appears either unknown or unfavorable.[58]

Outer Space Treaty, Article X,[59] provides that governmental and non-governmental enterprises can be required to allow foreign competitors the opportunity to observe its launches. Furthermore, Article XII[60] requires all asteroid mining installations, equipment, and space vehicles on a celestial body to be open to representatives of other States Parties on the basis of reciprocity.[61] The requesting State must give adequate advance notice. It might be technically difficulty to allow such inspection of an asteroid.

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[56] BIN CHENG, *supra* note 37, at 655 – 658.

[57] Outer Space Treaty, *supra* note 12.

[58] *See* Paul B. Larsen, *Application of the Precautionary Principle to the Moon,* 71 J. AIR. L. & COM. 295 (Spring 2006).

[59] Outer Space Treaty, *supra* note 12.

[60] *Id*.

[61] Compare Antarctic Treaty, *supra* note 27, at art. VII.

B. The Outer Space Treaty as Customary International Law

Customary international law may move slowly from voluntary towards absolute acceptance as binding international law. States gradually expect the new practice to be accepted law. Ultimately States are obligated to accept it equally with treaty law. Having been widely adopted, the Outer Space Treaty's main principles have become customary international law. At least, Arts. I, II, and III constitute customary international law, but strong argument can be made that all the fundamental principles of the Treaty, as well, have matured into customary law. [62] The Treaty is almost universally adopted and has become accepted over a long period of time. It now represents general practice accepted as law,[63] and there have been no objections. These articles thus apply both to States that are parties to the Treaty as well as to States that have not ratified the Treaty.[64] As customary international law, they apply to non-party States and will apply to States even if they decide to denounce the Treaty.[65] Customary international law is applicable to asteroids on the theory that asteroids are included within the scope of the Outer Space Treaty.

The Outer Space Treaty regulates all "human interaction with all naturally occurring extraterrestrial physical objects."[66] The Treaty obligates not only the ratifying States but all other States as regards those parts of the Outer Space Treaty which have become accepted as customary international law. [67] Lyall and Larsen conclude:[68]

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[62] David A. Koplow, *ASAT-ISFACTION: Customary International Law and the Regulation of Anti-Satellite Weapons*, 30 MICH J. INT'L L. 1187, 1233 (2009). LYALL & LARSEN, *supra* note 23, at 60 – 70. Vereshchetin and Danilenko are of the view that at least Arts. I, II, II, and VIII of the Outer Space Treaty constitute customary international law, *see* Vladlen S. Vereshchetin & Gennady M. Danilenko, CUSTOM AS A SOURCE OF INTERNATIONAL LAW OF OUTER SPACE, 13 J. SPACE L. 22. (1985).

[63] *See* Statute of the International Court of Justice, at art. 38(1), 57 Stat. 1055. T.S. 993, 3 Bevans 1153.

[64] LYALL & LARSEN, *supra* note 23, at 60 – 70.

[65] *See* Vienna Convention, *supra* note 10, at art. 28; LYALL & LARSEN, *supra* note 23, at 70-80.

[66] LYALL & LARSEN, s*upra* note 23, at 179.

[67] *Id*. at Chapter 3.

[68] *Id*. at 80.

> Doubtless in the future, new agreements will have to be worked out for aspects of the commercial and private exploitation of space, but the major rights and duties of states that comprise the framework of space law in its public international aspect are clear both under the OST and now under customary international law."

Apart from the Outer Space Treaty, formation of other new customary law of outer space on asteroids may be a slow process.[69] Formation of new customary law on asteroids may not happen as quickly as needed by commercial mining operators.

C. The 1979 Moon Agreement[70]

In this discussion, it needs to be emphasized that the Moon Agreement has only 15 ratifications, and it is not ratified by the major space-faring States, including the United States and Russia, which are the most likely explorers and exploiters of asteroids. In negotiation of the Moon Agreement, the COPUOS Legal Subcommittee provided context for the Outer Space Treaty. The Moon Agreement repeats essentials of the Outer Space Treaty but also implements and amplifies that Treaty. In the Moon Agreement negotiations, the Legal Subcommittee sought to clarify to some extent what it intended in the Outer Space Treaty. For example, the Agreement makes explicit that international space law does not apply to extraterrestrial matter, such as asteroids, "that reach the surface of the Earth by natural means." [71] (Emphasis added) Such extraterrestrial matter may become subject to State sovereignty and in turn may become private property. For the purpose of this discussion, a relevant question is: what is the legal status of extraterrestrial matter that is brought to the surface of the Earth, not by natural means, but by artificial means as proposed by asteroid mining companies? If asteroids captured in outer

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[69] Koplow, *supra* note 8, at 275 ("The formation of international custom is a difficult process and intentionally so; it is only through examples of State practice that a new custom can be deduced and only when such practice is pursued from a belief that the actions are legally required that new custom emerges").

[70] Moon Agreement, *supra* note 12, at art. 1 (stating that all applications to the Moon also apply to celestial bodies).

[71] *Id.* at art. 1(3). *See* discussion *supra* notes 13, 14, and 15.

space, brought to the Earth by artificial means, remain subject to the outer space law,[72] they may not become private property.

An initial distinction can be made between exploratory mining and commercial exploitation of asteroids. That may relevant for NASA's planned exploratory capture and subsequent examination of an asteroid in lunar orbit.[73] While the Outer Space Treaty generally permits exploration, the 1979 Moon Agreement makes clear distinction between exploration and exploitation.[74] Its Article 6 would give States specific freedom to do scientific research on celestial bodies, because Art. 6(2) states:

> In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the Moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. States Parties may in the course of scientific investigation also use mineral and other substances of the Moon in quantities appropriate for the support of their missions.

While samples of celestial bodies may be collected, Article 11(3) of the Moon Agreement states unambiguously that neither the surface not the subsurface of celestial bodies "shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or any natural person." Importantly then, the Moon Agreement states how commercial exploitation should take place. Article11(5) provides that commercial exploitation will be possible under "an international regime, including appropriate procedures, to govern the exploitation of the natural resources" of

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[72] *See* discussion of One Ten Inch Wooden Plaque*, supra* note 15.

[73] Described above in Section I, Introduction.

[74] *See* discussion of differences between exploration and exploitation in Paul B. Larsen, *Moon and Mars Exploration and Use*, *in* IISL PROCEEDINGS, Section 4.12, 370 (IISL 2004). But note that the United States is not a party to the Moon Agreement, *supra* note 12.

celestial bodies. Such a regime is to be created in future international negotiations. It would presumably create not only a new legal regime but it would also establish some kind of international administrative framework and appropriate regulations for exploitation of resources.[75] Art. 11(5) provides that States shall undertake to establish the new legal comprehensive regime "as such exploitation is about to become feasible." Consequently, if States and their non-governmental entities are now ready to begin their exploitation of asteroids, this would be the time to enter into negotiations in COPUOS.

The Moon Agreement, Art. 11(7), lists four principles to be the basis for a future regime. They are:

- Orderly and safe development of natural resources,
- Rational management of those resources,
- Expansion of opportunities in use of those resources, and
- Equitable sharing of those resources.

Must a new regime be based on these four principles? No, a future diplomatic conference would be sovereign in and of itself. The negotiators ultimately would be free to negotiate a new regime based on principles and terms to be decided by the negotiating States at such future diplomatic conference. A relevant precedent is found in the proceedings of the Law of the Seas (LOS) Convention.[76] The United States declined to sign the 1982 LOS Convention primarily because of its unfavorable regime for extracting resources from the non-sovereign deep seabed. Consequently, the United Nations convened a second negotiation in 1994 which created a more favorable regime for exploitation of the seabed resources. It should be noted that the 1994 Agreement (Protocol)[77] is not an amendment of the LOS Convention. It is a separate treaty instrument that is subsequent in time to the 1982 LOS Convention:

- States will jointly allocate and administer exploitation licenses based on their economic and political interests.

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[75] BIN CHENG, *supra* note 37, at 373.

[76] United Nations Convention on the Law of the Sea, U.N. Doc. A/CONF.62 (Oct. 7, 1982)[hereinafter Law of the Sea Convention].

[77] Law of the Sea, G.A. Res. 49/28, 49 U.N. GAOR Supp. (No. 49) at 35, U.N. Doc. A/49/28 (1994), *opened for signature* Dec. 10, 1982 1832 U.N.T.S. 3 (*entry into force* Nov. 16, 1994)[hereinafter Law of the Sea].

- Resources will be developed based on commercial principles.
- There are limits on the duty to share resources.
- No technology sharing.
- Mining sites will be allocated on first come first served basis.
- States will not have to expend funds to develop sites other than their own.

Considering that both the LOS Convention (1994 Protocol) and the Outer Space Treaty, further implemented and amplified by the 1979 Moon Agreement, concern the exploitation of resources in non-sovereign areas, it is not surprising that space lawyers have tended to advocate using the Law of the Seas model for orderly and uncontested exploitation of outer space resources, such as asteroids.[78]

Finally, States are in disagreement whether the Moon Agreement establishes a moratorium on exploitation of asteroid resources pending negotiation of the future regime mentioned in Art. 11(5). There is no specific language in Art. 11 to that effect. Parties to the Moon Agreement may be subject to a moratorium on exploitation of asteroid resources, but the many non-parties would not be bound by the Treaty.[79]

D. Liability

The Outer Space Treaty, Art. VII, is logically related to its Art. VI. Art. VII makes each State "internationally liable" for damages caused by their States and by their non-governmental activities whether caused on Earth, in air space or in outer space (including asteroids). Bin Cheng concludes that "all activities in space whether carried on by a governmental or non-governmental agency are deemed to be governmental activities involving direct State responsibility."[80] State liability for outer space activities is also properly based on customary international law under which

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[78] Maureen Williams, *The Moon Agreement in the Current Scenarios*, *in* IISL PROCEEDINGS, Section 2.02, 117 (IISL 2010).

[79] LYALL & LARSEN, *supra* note 23, at 195.

[80] BIN CHENG, *supra* note 37, at 237.

States are subject to the general international law principles of liability governing damages caused by States toward each other.[81]

Outer Space Treaty, Art. VII, is further amplified by the Liability Convention, Art. II, which makes the launching State absolutely liable for damage caused by its governmental and nongovernmental space object on Earth and to aircraft in flight. Art. III makes the launching State liable for damage caused elsewhere than on Earth based on proof of fault.[82]

The liability of the States authorizing asteroid activities is relevant because both the Outer Space Treaty and the Liability Convention establish State liability for both governmental and non-governmental asteroid activities.[83] Consequently, to avoid liability, States have to be careful about authorizing asteroid activities. Narrowly defined operational permits to responsible non-governmental operators, as required by the Treaty, will reduce actionable liability of governments.

E. Satellite Registration [84]

Both governmental and non-governmental spacecraft used for asteroid activities must be registered, thus providing transparency about use of satellite operations for asteroid activities. Satellite registration results in greater transparency about asteroid activities. It also facilitates State exercise of jurisdiction under Art. VIII of the outer Space Treaty, which presumes that States register their satellites, because registration is the basis for national governments to exercise jurisdiction over the satellites which they have registered. That also determines national property law applicable on board the spacecraft. UN registration of space objects can be accessed by the public. It is an electronic registry enabling any-

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[81] See Arthur K. Kuhn, *The Trail Smelter Arbitration –United States and Canada*, 32(4) AMER. J. INT'L. L. 785 (Oct. 1938); Arthur K. Kuhn, *The Trail Smelter – United States and Canada*, 35(4) AMER. J. INT'L. L. 665 (Oct. 1941); and The Factory at Chorzow (Germ. v. Pol.), 1928 P.C.I.J. (ser. A) No. 17 (Sept.13). *See also* LYALL AND LARSEN, *supr*a note 23, at 103.

[82] *Supra* note 12.

[83] Outer Space Treaty and Liability Convention*, supra* note 12.

[84] Registration Convention*, supra* note 12. *See also* Recommendation on Enhancing the Practice of States and Intergovernmental Organizations in Registering Space Objects, G.A. Res. 62/101, U.N. Doc. A/RES/62/101 (Jan. 10, 2008) at http://www.unoosa.org/en/SpaceLaw/index.html.

one to know the location of satellites. Registration is also useful in identifying States liable under the Outer Space Treaty and the Liability Convention. Unfortunately, States are often tardy in making registrations. Some space objects are never registered thereby causing special problems. Under the Registration Convention, launching States are specifically required to register both its governmental and its non-governmental satellites. The satellite registration requirement established yet another government control over non-governmental space activities.

F. Rescue and Return Agreement [85]

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space is also relevant to asteroid activities. Outer Space activities are extremely dangerous. The Treaty requires States to assist astronauts who "have alighted on the high seas or any other place not under the jurisdiction of any State." Astronauts must be returned to the launching State. Secondly, lost space objects must also be returned to the launching State. Thirdly, the launching State has an obligation to retrieve hazardous space objects and components from another State where they may have fallen accidentally.[86]

Many of planned asteroid activities could trigger application of this Agreement. Astronauts need to be rescued. Will miners on an asteroid be covered by this Agreement? Governments may be responsible for the consequences of toxic and hazardous materials.

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[85] Rescue and Return Agreement, *supra* note 12.

[86] *Id*. at art. 5; *see* Mark J. Sundahl, *The Duty to Rescue Space Tourists and Return Private Spacecraft*, 35 J. SPACE L. 169 (2009). Sundahl is of the view that astronauts in outer space are probably protected by the treaty, but he doubts that non-astronauts are legally entitled to rescue and return.

G. 2012 Protocol on Space Assets[87]

The new treaty instrument on space assets (Space Protocol to the Cape Town Convention) has not yet been ratified by any State; but it deserves to be mentioned. Some, if not most, of the private asteroid mining enterprises will be financed by financiers or banks. The asteroid mining business is as yet uncertain and speculative. Under the Space Protocol, a special registry of secured 'space assets' will be established. In case of default, the financier will seek to control these assets. The legal regime of the Space Protocol will govern only man-made materials that fit the Protocol's definition of space assets. They must be uniquely made to be launched into outer space. The Protocol will not govern the minerals mined on asteroids. The Space Protocol will provide the means and the rules for the financier's security and possible recovery of his interests in the event of default on loans.[88]

II. SPECIFIC ISSUES: ARE ASTEROIDS UNIQUE AND THEREFORE DISTINGUISHABLE FROM EXISTING SPACE LAW?

The obvious question is whether asteroids belong under the international space law applicable to the Moon and the large planets, such as Mars and Venus. Are asteroids outside international space law? Or, are asteroids subject to existing international space law for all but issues relating to extraction of resources? The obvious implication to be drawn from the previous discussion is that asteroids do not fit well under existing space law, but they also to not exist in a legal vacuum. While the focus of the Outer Space Treaty drafters in 1967 was on the Moon because of the competition between the United States and the then-Soviet Union, the drafters did not focus particularly on asteroids and their special nature. The Treaty appears drafted to include them. However,

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[87] Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (Berlin 2012) [hereinafter Space Protocol], *see* Appendix to the Official Commentary by Professor Sir Roy Goode (Unidroit 2013), both documents can be found at http://www.undroit.org. Mark Sundahl, adds that "the transformation of mined metal through human effort into a new object would allow for the application of the Convention to that object, assuming that other features of a space asset are met," MARK J. SUNDAHL, THE CAPE TOWN CONVENTION, ITS APPLICATION TO SPACE ASSETS AND RELATION TO THE LAW OF OUTER SPACE 35 (Martinus Nijhoff 2013).

[88] Space Protocol, *supra* note 87, at Chapter II, Default Remedies, Priorities, and Assignments.

in current times new needs have arisen, for example to change the orbits of asteroids to divert NEOs from colliding with the Earth, to scientifically examine asteroids as original building blocks of the solar system, and to accommodate commercial exploitation.

1. May a State or Mining Prospector Unilaterally Change Asteroids' Orbits?

Changing the orbits of asteroids for any of the above-mentioned reasons would constitute exercise of control over asteroids and thus an appropriation under Art. II of the Outer Space Treaty because the purpose of Art. II is the prohibition of appropriation by any means. Change of asteroids' orbits possibly would necessitate modifying space law to accommodate current needs that were not evident to the drafters of the 1967 Treaty.

2. Does the Multitude of Asteroids make them Unique?

Does the great multitude of asteroids in our solar system make their legal status different from other celestial bodies? The Minor Planet Center in the United States collects data on asteroids and has registered more than 750,000.[89] Other centers also collect data. The multitude of asteroids clearly distinguishes asteroids from the large planets. Does their plentitude cause them to be more expendable and therefore legally different than the Moon and the large planets? It can be argued that they constitute different legal problems than do the Moon and the large planets, such as Mars and Venus. The multitude of asteroids may indicate that they are less precious than the planets. On the other hand, the reason for capture and exploitation of particular asteroids may be that they are made of gold or platinum and therefore extremely valuable. In fact, an asteroid may be of no economic interest unless it is made of rare and precious materials. So the sheer multitude of asteroids does not necessarily place them in a different legal category.

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[89] Peter B. de Selding, *U.N. Panel to Call for Global NEO Tracking Network*, SPACE NEWS, May 29, 2013, at 5.

3. Asteroids, such as Near Earth Objects, are Dangerous to Earth: Should They Therefore be Treated Differently?

Past experience with Near Earth Objects have resulted in disastrous collisions with Earth. An NEO supposedly caused drastic climate change on Earth and caused extinction of the dinosaurs.[90] For this reason, asteroids are potentially more dangerous to Earth than are the Moon and the planets. That raises the argument that people on Earth should be permitted to change asteroid orbits in order to save the Earth. Thus, different treatment of NEOs could possibly be linked to disturbance of peace and security. NEOs may surprise us on Earth as did the asteroid that exploded in 2013 over Chelyabinsk, Russia.[91] It could be argued that, rather than wait to agree on different treatment of NEOs when they become dangerous, we should accept different legal treatment now before NEOs surprise us and become dangerous. This could be in the form of an exception to Art. II, or by a new treaty on NEOs. One legal approach might be to treat a threatening NEO as a danger to peace and security enabling the UN Security Council to authorize action under Chapter VII of the UN Charter. Individual States having the technical capability might perceive an immediate threat to its peace and security and claim legal authority under the UN Charter, Art. 51 to act unilaterally until the Security Council takes action.[92]

4. Does the Small Size of Asteroids Make Them Unique?

Asteroids come in many sizes but they tend to be smaller than planets. The asteroid that exploded over Chelyabinsk was

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[90] The Cretaceous-Tertiary extinction event happened 65.5 million years ago. This theory about the cause of the extinction of the dinosaurs was argued in M.W. De Laubenfels, *Dinosaur Extinctions: One More Hypothesis*, 30 J. OF PALEONTOLOGY 207-218. The theory was subsequently disputed, *see* Gerta Keller, Chicxulub – The Non-Smoking Gun (CCNet 2003). *See also* LYALL & LARSEN, *supra* note 23, at 312.

[91] *Defenders of the Earth, supra* note 6.

[92] U.N. Charter, art. 51, *opened for signature* Jun 26, 1945, 59 Stat. 1031, T.S. 993, 3 Bevans 1153 (*entered into force* Oct. 24, 1945). Note the Outer Space Treaty, Art. III, stating that the Outer Space Treaty shall be carried out in accordance with the UN Charter. Koplow, *supra* note 8, at 281 (accepting that "under existing international law of self-defense a State has the inherent right to defend itself against an impending asteroid attack, as this is an example of the most natural form of self-defense and does not involve questions of aggression."). *See also* discussion *infra* at note 139.

only 15 – 20 meters in diameter.[93] It could be argued that the small size of most asteroids make them different from the Moon and the planets and that therefore they should be categorized and treated differently than the large space planets. However, asteroids come in all sizes. Some of them are quite large and do not fit a categorization by size. Thus, asteroids would not be distinguishable from existing space law merely because of size.

5. Did the Outer Space Treaty Drafters Overlook Asteroids?

The argument can be made that the drafters of the Outer Space Treaty were preoccupied with Cold War issues, the competition between the then two space powers, the United States and the then-Soviet Union, and the approaching moon landing so that they did not sufficiently focus on asteroids. That would be a weak argument because of the specific references to the Moon and the catch-all phrase 'celestial bodies' which swept everything within the scope of the Outer Space Treaty establishing basic principles for exploration and use of outer space. The plain meaning of the Outer Space Treaty is that it applies to all of outer space, including asteroids.[94]

6. Has There Been a Fundamental Change of Outer Space Circumstances in Modern Times Justifying Withdrawal of Asteroids from the Outer Space Treaty?

Art. 62 of the Vienna Convention on the Law of Treaties addresses the situation when there has been such a fundamental change in circumstances of the parties to a treaty sufficient to invoke fundamental change of circumstances as legal basis for termination or withdrawal from a treaty. Art. 62[95] sets very high standards for terminating treaty obligations. Has there been such

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[93] *Defenders of the Earth*, *supr*a note 6.

[94] Vienna Convention, *supra* note 10, at arts. 31 and 32.

[95] *Id*. at art. 62 stating that a fundamental change of circumstances will not be excuse a State unless:

(a) The existence of those circumstances constituted an essential basis of the consent of the parties to be bound by the treaty; and

(b) The effect of the change is radically to transform the extent of the obligations still to be performed under the treaty.

Id.

a change of circumstances among the parties to the Outer Space Treaty? Has the basis for existence of the Outer Space Treaty of 1967 changed fundamentally by 2013? Was the effect of change in circumstances to such an extent that the parties should be relieved of their treaty obligations? Actually, people on Earth, including the 1967 negotiators, knew about the multitude of asteroids and danger of NEOs at the time the Treaty was drafted. Furthermore, invoking Article 62 would result in termination or withdrawal from the Outer Space Treaty which States probably would not want to have happen. Most States, including the United States, are very reluctant to reopen the Outer Space Treaty for renegotiation of basic sovereignty issues because that would disturb the existing balance of power between the States.[96]

7. Has There Been a Subsequent Major Change in Outer Space Practice Among the States?

Interpretation of the Outer Space Treaty may be influenced by practices developed subsequent to the drafting of the Treaty.[97] In order to influence interpretation of the Treaty, such subsequent practices must be generally accepted among the States. An argument can be made that people, including the drafters, generally did not think of exploiting asteroids in 1967, but that such practices developed after 1967. Actually, there has been some exploration but very little exploitation of asteroids since 1967. That weakens the significance of subsequent practices. Another weakness is the language of Art. II explicitly prohibiting all 'appropriation" of celestial bodies. Much of the substantial activities contemplated on or for asteroids clearly fall into the category of appropriation, in particular those activities involving full control and changes of orbits. Thus, the explicit language of the article weakens the effort to modify it.

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[96] Renegotiation of the Outer Space Treaty could result is divergent versions which would not be desirable; see LYALL & LARSEN, *supr*a note 23, at 58.

[97] Vienna Convention, s*upra* note 10, at art. 3(b), provides that treaty interpretation may take into consideration "any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation".

8. Are New Rules on Exploitation of Asteroids Now Necessary?

One reason, for the vacuum in outer space economic development since the Outer Space Treaty was adopted in 1967, is that there has been no urgent demand for asteroid development. However, considering the present interest in exploration by NASA and international agencies in exploitation of the resources, as well as urgent focus on the dangers of NEOs, and the potential conflicts in the absence of new international laws, it might seem wise to act as soon as possible to create rules necessary for the new uses of outer space.[98] There need not be a grand regime such as proposed by the Moon Agreement Art. 11 (5). Nor would the standard need to be the high and comprehensive common heritage of mankind.[99] A limited agreement could involve recognizing the legality of what the States are now doing (or preparing to do) on asteroids. It could be a standard simply favoring exploitation. The next section will examine a number of different options for a new asteroid legal regime.

III. NEW SOFT INTERNATIONAL LAW ON ASTEROIDS

Non-governmental entities are subject to the space law treaties described above.[100] Non-governmental entities are also regulated by a host of rules that do not amount to treaty law. Many of these rules are so-called 'soft law' rules. They are in the form of international resolutions, working arrangements, standards and recommended practices, voluntary codes of conduct and guidelines.[101] A good example are the voluntary rules for mitigation of space debris drafted by the Inter-Agency Space Debris Coordination Committee (IADC).[102] Soft law does not have the finality of hard treaty law, but it can have the benefits of certainty, uni-

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[98] Moon Agreement, *supra* note 12, at art. 11(5) ("States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible.")

[99] *Id*. at art. 11(1).

[100] See Section II.

[101] LYALL & LARSEN, *supra* note 23, at 50 – 52.

[102] IADC, Space Debris Mitigation Guidelines, U.N. Doc. A/AC.105/C.1/L.260; COPUOS, *Report of the Scientific and Technical Subcommittee on its forty-fourth session, held in Vienna from 12 to 23 February 2007*, U.N. Doc. A/AC. 105/890 (June 6-15, 2007); G.A. Res. 62/217, U.N. Doc. A/RES//62/217* (Dec. 22, 2007).

formity, and predictability provided by treaty law. Being more flexible than treaty law, soft law has the advantage of being easier to change than treaty law. Thus, soft law is particularly desirable for non-governmental entities that need flexibility to fit business into market conditions. Soft law often allows for participation of interested non-governmental entities in rulemaking. "[W]hile treaty making is a matter for the States, (which may not always be as well informed as may be desirable) soft law allows non-state entities and particularly those whom it may directly affect to take part in its formation."[103]

Internationally agreed standards can be as effective as treaty law. Expressing commitment to international standards, then then-US Secretary of Defense Leon Panetta stated[104] "We share a commitment to abide by international standards and international norms – rules of the road, if you will - which promote international stability and peace for the world." His statement is consonant with President Obama's 2010 National Space Policy.[105]

From the viewpoint of non-governmental operators, national space laws serve the multiple purposes of implementing space treaty laws, particularly implementing the Outer Space Treaty, Art. VI, by virtue of which States Parties must "require authorization and exercise continuing supervision" over non-governmental operators to assure their compliance with the Outer Space Treaty obligations. In addition to implementation of multiple treaty obligations, State laws also regulate many economic, safety, environmental, and national security aspects of outer space activities. Thus, governmental and non-governmental entities are subject to many regulatory standards.

Several existing standards for outer space activities have multiple purposes. For example, the space debris mitigation standards are aimed at safety of navigation in outer space, and also at preserving the environment in outer space, and at national security. Management competency also has safety and possibly environmental implications. There is a movement towards space industry standards at the working levels thereby indicating possi-

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[103] LYALL & LARSEN, *supr*a note 23, at 50 – 52.

[104] *See* Leon E. Panetta, *The U.S. and India: Partners in the 21st Century*, SPACE NEWS, July 10, 2012 19.

[105] National Space Policy, *supra* note 3.

ble readiness for international standards. For example, as the US statutory moratorium on FAA regulation of safety of space flight participants is ending, the FAA is working on regulatory standards that would improve safety oversight over space vehicles in orbit.[106]

Would non-treaty approaches to regulation of asteroid activities have to remain within the confines of existing international space law? States could adopt different rules of conduct voluntarily and then apply such rules among themselves, but States not adopting such voluntary rules of conduct could insist on their legal rights under the existing treaties. It would be difficult to change the existing rights and obligations of third parties without their consent.[107]

A slightly different approach would be to examine existing law for legal authority to regulate. There are some very broad clauses in the Outer Space Treaty that arguably could be used to regulate competing claims. For example, the provision in Art. I of the Treaty that celestial bodies shall be free for exploration and use by all States ("without discrimination of any kind, on a basis of equality and in accordance with international law") could possibly be used to regulate competing claims to use of asteroids. Such regulation, whether national or international, would be implemented by the States pursuant to their Art. VI mandate to carry out the terms of the treaty through their exercise of jurisdiction and control over their satellites and astronauts under Art. VIII. Alternatively, the International Court of Justice could be asked to adjudicate treaty violations.[108]

Soft law options range from tolerating lack of order in asteroid activities, to the following kinds of 'soft' regulation: (1) regulation modeled on regulation by existing international regulatory agencies; (2) self-regulation; (3) adoption of voluntary guidelines, such as the UN space debris guidelines; (4) a code of conduct for asteroid activities; (5) formation of a special COPUOS body on

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[106] See Paul B. Larsen, *Safety Standards for Outer Space Activities*, *in* PROCEEDINGS OF THE 6TH IAASS CONFERENCE, 63 (Montreal, Canada; May 21 – 23, 2013). *See also* http://iaassconferene2013.space safetyfoundation.org

[107] Vienna Convention, *supra* note 10, at art. 35 (stating that obligations cannot be imposed on third States without their consent, and Art. 36 stating that acceptance of rights for third parties shall be presumed unless objection is indicated.).

[108] Statute of the International Court of Justice, *supra* note 63, at art. 36.

asteroids, such as the International Committee on Global Navigation Satellite Systems (ICG).

A. The Option of Continuing the Status Quo until Objections are Raised.

At the present time, there is no special coordinated regime for asteroids. COPUOS is seeking to orchestrate an international network of stations to track NEOs in order to warn of dangerous asteroids that may cause disasters on Earth. NASA aims to locate 90% of the most dangerous NEOs (over 140 meters in diameter).[109] The European Union, individual countries, as well as private parties are also tracking dangerous asteroids.[110] Tracking of asteroids may lead to intervention but COPUOS has not faced that issue yet. Several countries and private groups are weighing a variety of unilateral asteroid diversion options such as kinetic impact, gravity tractor, or nuclear explosions.[111] However, unilateral NEO diversion from one country or continent may result in disastrous damage in another country or continent and may thus be subject to strong objections. International coordination of NEO diversion will evidently be necessary, particularly because intervention with the asteroid will take place in non-sovereign outer space.

NASA's plan to capture an asteroid and bring it into lunar orbit for closer examination by astronauts has considerable international interest.[112] The more participation there is by other spacefaring States, the less they are likely to contest the diversion of an asteroid's orbit. However, suppose the asteroid chosen by NASA is composed of gold or platinum, i.e. it is very valuable. Then, other countries might also claim this particular asteroid. It is quite possible that some private operator would claim such an asteroid as private property under national law.[113] NASA's plan could therefore easily be challenged unless totally agreed and coordinated internationally.

The plans of commercial companies to mine valuable asteroids either in space or by dragging them down to Earth for exploi-

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[109] *Defenders of the Earth*, *supr*a note 6.
[110] *Id*.
[111] *Id*. *See* discussion *supra* note 92, and *infra* note 139.
[112] National Space Policy, s*upr*a note 3, and Houston, *supra* note 4.
[113] *See Nemitz, supra* note 47; *but see* Dembling, *supra* note 43.

tation might also succeed if unchallenged. In order to receive government protection, the company could apply for a license from its government pursuant to the Outer Space Treaty, Art, VI. For that purpose, there should be national regulation authorizing such a mining license. Furthermore, the licensing government would be subject to claims by other States which might issue an identical license in accordance with its treaty rights under the Outer Space Treaty.[114] Alternatively, an asteroid mining company might decide to seize a precious asteroid without a national license in which case other claimants might challenge the legal right of the company to the asteroid and its resources.[115] The company might also have to persuade a bank or financier to finance its venture and the bank would want assurance that the company could obtain clear title to the asteroid property. That assurance might be difficult to produce. Lack of clear title would endanger outside financing.

Most intriguing about the option of doing nothing is that new asteroid activities could become customary international law by continuous practice and general acceptance of those practices. For example, suppose NASA and space agencies of other States capture asteroids in orbit and change orbits as proposed by NASA and suppose nobody objects and the practice continues over a period of time, then a legitimate legal argument can be made that the practice is permitted by customary international law.[116]

B. Regulatory Standards Modeled on the International Civil Aviation Organization (ICAO) Annexes

There are many models for effective international soft law standards in fields related to outer space. In the 1944 Convention on International Civil Aviation,[117] Art. 37, all the contracting

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[114] Outer Space Treaty, *supr*a note 12, at art. VI.

[115] *See Nemitz, supra* note 47, *see also* Dembling, *supr*a note 43, and particularly Dembling's statement, *supra* note 52, that the Outer Space Treaty, Art. VI, prohibits unregulated activities in outer space.

[116] *See* discussion of customary international space law of asteroids, *supra* at section II(B). However, development of customary international law allowing deliberate changes in orbit by use of nuclear explosion would be difficult because of the explicit prohibition on nuclear explosions in outer space in the Nuclear Test Ban Treaty*; see* Test Ban Treaty, *supra* note 49.

[117] The Convention on International Civil Aviation, *opened for* signature Dec. 7, 1944, 15 U.N.T.S. 295, 61 Stat. 1180, T.I.A.S. 1591, 3 Bevans 944 (entry into force Apr.

States agreed to collaborate on establishing uniform international standards and recommended practices (SARPs) for civil aviation. These standards and practices are established in ICAO. They are known as Annexes to the Chicago Convention. The Annexes are in essence 'living law' because they are constantly updated by ICAO to reflect current needs. The ICAO international standards and recommended practices are an excellent example of how soft law can be created by States in an international organization, which then become adopted and applied by all the States and, through the States, by the non-governmental entities having an interest. The adopted aviation standards are essential for safety and for successful use of air space. Lack of such international standards would make air travel impossible.

In principle, uniform standards and recommended practices for outer space activities would similarly make non-governmental activities in outer space safe, secure, and orderly. In the absence of an enforcing international organization, the standards and recommended practices could be voluntary. States would appreciate their international uniformity and would have the option of making them mandatory. [118]

Who would promulgate international regulatory standards on issues such as mining and interference with the orbits of asteroids? In the field on international space regulation, COPUOS might be the most likely forum, but COPUOS would have to create a technical subcommittee such as the ICAO Air Navigation Commission or the Inter-Agency Space Debris Coordination Committee to draft standards. [119]

C. International Telecommunication Union (ITU) Regulation of Outer Space Resources[120]

Could orderly international allocation of asteroid resources be accomplished by ITU?[121] ITU currently uses its radio regulations

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4, 1947) [hereinafter Chicago Convention] established the International Civil Aviation organization (ICAO).

[118] *See Safety Standards for Outer Space Activities*, *supra* note 106.

[119] Chicago Convention, *supra* note 117, at arts. 56 & 57. *See also* the IADC voluntary rules for mitigation of space debris , IADC, *supra* note 102.

[120] *See also* Section IIII(C) (1*) infra*.

[121] International Telecommunications Union [ITU], Collection of Basic Texts of the International Telecommunication Union adopted by the Plenipotentiary Conference

to keep order in uses of telecommunication satellites by assigning radio frequencies for transmission to and from such satellites and for assignment of orbital slots for these satellites. The ITU Radio Regulations require the Radio Regulations Board to make "rational, equitable, efficient and economical use" of the radio spectrum and make orbital slot assignments accordingly.[122] The result is absence of harmful radio interference and cleared radio channels which are necessary for use of communication satellites. Allocation is made by ITU to a State member. The State either uses the allocation itself or assigns it to a non-governmental operator.[123]

The ITU Radio Regulations Board[124] (successor to the International Frequency Registration Board) administers the resource allocations by accepting applications from interested States. Those States are asked by the ITU Board to negotiate and compromise among themselves to produce only one applicant. That applicant is then authorized to use the radiofrequency with its accompanying orbital slot.[125] The result is that the user has assured and unchallenged use of the resource.

Whether a similar ITU regulatory regime could be applied by ITU for use of asteroids is doubtful. ITU would have to be willing to assume the additional regulatory burden. The Radio Regulations Board would have to receive additional authority from ITU. However, if this were the only way that orderly use of asteroids could be accomplished, this strategy might be pursued.

D. Industry Self-imposed Operating and Mining Regulations

In the absence of government-imposed regulations and in order to avoid confusion, unnecessary mistakes, or even chaos; would operating regulations established by the operators themselves be feasible? For example, asteroid mining operators might

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(2011), at http://www.itu.int/net/about/basc-texts/index.aspx or http://www.itu.int/pub/S-CONF-PLEN-2011/en. *See also* LYALL & LARSEN, *supra* note 23, Chapter 8, Radio and International Telecommunication Union.

[122] LYALL & LARSEN, *supra* note 23. ITU Const. art. 44; ITU, Radio Regulations (2008) *available at* http://www.itu.int.pub/R-REG-RR-2008.

[123] For example, the U.S. Federal Communication Commission (FCC) has authority to prescribe qualifications for radio operators, to assign radio frequencies and to suspend licenses under 47 U.S.C. §§301 & 308.

[124] *Id.*

[125] *Supra* note 120, and ITU Const., *supra* note 122.

form an international industry association to coordinate mining activities. Such associations could prevent multiple operators from contesting among themselves; they could share information and thus avoid business interruptions; they could also establish operating regulations for mining. Such coordinated regulations could be designed to stay within the frame of international space law. Coordination and sharing of information is already taking place among commercial communication satellite operators who have formed the Space Data Association to share information about the location of satellites and in particular space objects which threaten to collide with communication satellites.[126]

Needless to say, private self-imposed regulation might not be compatible with NASA's plans for diverting an asteroid into lunar orbit, nor for prevention of NEOs from colliding with Earth. But would it work in the area of asteroid mining?

In the absence of international guidance by an international body, industry self-imposed regulation would fill a void. There are precedents in other kinds of commercial activities. In international air transportation, many international airlines belong to the International Airline Transportation Association (IATA) and many maritime shipping lines belong to so-called 'liner conferences.' These associations have encountered government regulation for anti-competitive practices[127] and self-imposed industry economic regulation would be subject to such government intervention. However, these industry associations are permitted to engage in industry technical coordination which is not anti-competitive. In maritime transportation, the American Bureau of Shipping (ABS) is permitted to set safety standards for the construction of ships and to examine whether existing ships continue to conform to safety standards. Over 10,000 ships are 'classified' by the ABS.[128] The US Government delegates to the ABS to determine whether ships comply with the Load Line Convention, the Safety of Life at Sea Conventions, and the Marine Pollution Convention[129]

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[126] *See* Andrew D'Uva, *Turn Signals for Satellites*, SPACE NEWS Jun. 29, 2011, at 19.

[127] Enforcement of anti-trust laws, by the United States Government, under the Sherman Antitrust Act, 15 U.S.C. §1.

[128] American Bureau of Shipping, Annual Review 2012 (2012), at 10.

[129] International Convention on Load Lines, *open for signature* Apr. 5, 1966, 18 U.S.T. 1857, 640 U.N.T.S. 133; International Convention for the Safety of Life at Sea,

States may delegate to private organizations their duties under the Outer Space Treaty as long as they comply with the Outer Space Treaty, Art. VI, requirement that" [t]he activities of non-governmental entities in outer space, including the Moon and other celestial bodies shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[130] The question remains whether it would be wise to delegate to the commercial mining industry the power to select its own experts to establish and enforce asteroid mining standards for the industry. The question is to what extent the industry can be entrusted with oversight of its own potential abuses. Considering that the objective of the mining industry is to make a profit, the temptation exists to promote profit over law and order.[131] Private self-regulation would also easily develop into anti-competitive practices contrary to the US anti-trust regulations.[132] Another consideration is that NASA, the European Space Agency (ESA), the Russian Government, and the Chinese Government have dominated outer space activities since the launch of Sputnik in 1957, so governments possess outer space technical expertise. Governments are also further removed from the industry profit motive of private mining companies and are better able to act impartially.[133]

E. The Option of an UNGA Resolution Establishing Guidelines on Asteroid Exploitation

COPUOS has had success in adopting nonbinding guidelines that have become international standards for outer space activities. The best example may be the outer space debris guidelines

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open for signature Nov. 1, 1974, 32 U.S.T. 47, T.I.A.S. 9700, 1184 U.N.T.S. 277; and the Convention on the Prevention of Marine Pollution, *open for signature* Dec. 29, 1972, 26 U.S.T. 2403,1046 U.N.T.S. 120.

[130] Outer Space Treaty, *supra* note 12, at art. VI.

[131] The competency of the private ABS organization is tested every time a ship has a serious accident. For example the oil tanker Prestige, which had been certified as being in compliance with ABS standards, sank off the coast of Spain in 2007. It caused severe oil spill that inundated the coast at great loss to French and Spanish fisheries. This brought ABS competency into question. Other maritime accidents have also brought into question ABS competence and sufficiency in making and enforcing maritime standards. *See also Safety Standards for Outer Space Activities*, *supra* note 106.

[132] Sherman Antitrust Act, s*upra* note 128.

[133] *See* discussion in *Safety Standards for Outer Space Activities*, *supr*a note 106.

which were adopted as an UNGA Resolution.[134] Outer space debris is such an acute problem in need of resolution that the spacefaring States have adopted the debris guidelines as mandatory national guidelines. Considering this precedent and the increasing urgent need for international order in activities relating to asteroids, States might consider adoption of UNGA guidelines on asteroid exploitation and on manipulation of NEOs. Such guidelines could then guide individual states in authorizing outer space activities and in enforcing the conditions attached to State-issued licenses. The assumption would be that each State would make sure that its treaty obligations under the Outer Space Treaty and other international law, including the UN Charter, were enforced. Such practice would follow the model established by the outer space debris guidelines. The following are examples of asteroid issues that could be the subject of UN guidelines.

1. Complete Transparency in Asteroid Operations

Considering how extremely hazardous are all activities in outer space, it is important that all the actors including governments and relevant nongovernmental entities be fully aware of each other's plans and activities. Any mistaken assumptions could lead to catastrophe. The first COPUOS guideline should therefore be for complete transparency.

Governmental and non-governmental operators are already under duty to keep the UN Secretary General and other States informed about outer space activities.[135] The United Nations has also assumed organizational functions relating to registry of space objects.[136] Coordination of activities and general information about planned activities in outer space could therefore be undertaken by an expansion of the UN Office of Outer Space Affairs (UNOOSA).

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[134] U.N.G.A. Res.62/217, *supra* note 103. See also the Principles Relating to Remote Sensing of the Earth from Space in Committee on the Peaceful Uses of Outer Space [COPUOS], Report of the Committee on the Peaceful Uses of Outer Space, U.N. Doc. A/41/20,at 24 (June 26, 1986) and G.A. res. 41/65, U.N. Doc. A/RES/41/65 (Dec. 3, 1986) and Corr. 1; and the Principles Relevant to Use of Nuclear Power Sources in Outer Space, G.A. Res. 47/68, U.N. Doc. A/RES/47/68 (Dec. 14, 1992).

[135] Outer Space Treaty, *supra* note13, at art. V.

[136] Registration Convention, *supra* note 13, requires registration of space objects. A central registry is maintained by the U.N. Office of Outer Space Affairs (UNOOSA).

A central Information center should include all three areas of asteroid activities: Collection of data and possible intervention with dangerous NEOs, seizure of asteroids for scientific experiments, and asteroid mining activities.

2. Preventive Actions for Diversion of Dangerous NEOs

The descent of an asteroid over Russia in 2013 illustrates the potentially destructive capability of NEOs.[137] Unilateral action by one of the space powers having capability of diverting an NEO could merely result in a diversion from one country causing such NEO to inflict extensive damage in another country. International coordination not only of data collection but also of possible diversionary action should be arranged centrally so that these NEO activities are done for the benefit of everybody on Earth.

One possible approach for international action would be to view a potential NEO strike as a threat to international peace and security. The Outer Space Treaty, Art. III, states that the Treaty is subject to the UN Charter.[138] COPUOS could therefore prepare a General Assembly Resolution exclusively on the subject of NEOs recommending the UN Security Council to consider a NEO to be a threat to the peace with authority to adopt a Security Council Resolution authorizing and coordinating international remedial action. Furthermore, in the event of an acute emergency in which the Security Council cannot act in time, individual States would likewise be allowed to react unilaterally to an immediate NEO's threat. The possible legal authority could be the inherent right of individual or collective self-defense until such time that the United Nations could take action under the UN Charter.[139] COPUOS might consider this option.

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[137] *Defenders of the Earth*, *supr*a note 6.

[138] U.N. Charter, *supra* note 93.

[139] *Id.* at art. 51. Art. 51 refers only to right of self-defense when an 'armed' attack on a State occurs. An NEO collision would not be an armed attack. However, relevant to this discussion is the- famous Caroline case, 2 Moore, International Law, 409 – 414. It is the seminal case on the right of self-defense. It limits the right of self-defense to attacks in which the "necessity of that self-defense is instant, overwhelming, and leaving no choice of means , and no moment for deliberation" See discussion of U.N. Charter, Art. 51*, supra* note 93; see also application of the Test Ban Treaty*, supra* note 50.

3. Minimizing Impact of Potentially Conflicting Asteroid Activity

Considering the many potential legal conflicts with the Outer Space Treaty, it would be wise for governments and for non-governmental operators to minimize the number of activities on asteroids. Operators could be advised to minimize their activities just as they are advised to minimize space debris.[140] Activities that can be construed under Art. II of the Treaty as appropriation of asteroids are a particular conflict problem.

Another guideline to minimize potential conflicts would be to coordinate activities with other potential exploiters, particularly those from other countries that may claim treaty rights to the resources in question. Contesting claims may be based on the Outer Space Treaty's Article I right to free access to all celestial bodies.[141]

Operators are required to pay due regard to the interests of other States pursuant to the Outer Space Treaty, Art. IX.[142] This would another good reason to minimize the impact of potentially conflicting asteroid activity.

4. Avoiding Environmental Harm to Asteroids

The Outer Space Treaty,[143] Art. IX, requires States to avoid harmful contamination of celestial bodies such as asteroids. Another potential remedy for harmful contamination would the Precautionary Principle which requires operators to exercise extra caution in undertaking outer space activities which may result unpredictable environmental consequences.[144]

Consequently, a guideline to minimize environmental harm to asteroids would be a likely COPUOS guideline. Such a guide-

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[140] Compare U.N. G.A. Resolution on outer Space debris, *supra* note 103.

[141] Outer Space Treaty, *supra* note 12.

[142] *Id*. Art. IX provides:

> In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty.

Id.

[143] *Id*.

[144] *Application of the Precautionary Principle to the Moon*, *supra* note 58.

line would naturally be directed to States to impose not only on governmental activities but also on non-governmental operators at the authorizing and licensing stage.[145]

F. Developing a Code of Conduct for Activities on Asteroids

The guidelines and recommendations suggested above for COPUOS action could also be the subject of a voluntary code of conduct for States that have activities in outer space.[146] Such a code would have somewhat the same effect as a UNGA Resolution, but it could exist independently of the United Nations. It would be similar to a code of conduct currently proposed by the European Union and negotiated among States in which States agree among other activities to:

-minimize debris generation,

-implement the Space Debris Mitigation Guidelines of UNGA Res 62/217,

-notify States of potentially conflicting outer space activities,

-pre-notify States of launches, collisions and break-ups, and

-notify of radioactive contamination and malfunctions in space.

States could similarly agree on a voluntary code to maintain transparency in all activities relating to asteroids, minimize potentially conflicting asteroid activities, avoid environmental harm, collect data on asteroids, prevent harm to Earth from NEOs, and issue national licenses for asteroid mining operators and other essential asteroid activities.

G. Establishment of a Special COPUOS Committee on Asteroids Like the ICG and UNSPIDER

COPUOS could establish a special committee to deal exclusively with asteroids. In recent years, COPUOS has established ancillary committees and groups, for example the International Committee on Global Navigation Satellite Systems (ICG),[147] which

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[145] Outer Space Treaty, *supra* note 12, at art. VI.

[146] Council Decision 2012/281/CFSP, 2012 OJ. (L140) 68 (EU).

[147] COPUOS, *Report on the United Nations/United States of America International Meeting on the Use and Applications of Global Navigation Satellite Systems*, U.N. Doc. A/AC.105/846 (Vienna, Dec. 13-17, 2004); *see also* http://www.unoosa.org/oosa/en/SAP/gnss/icg.html.

has several specialized subcommittees. Another special COPUOS unit is the UN Platform for Space-based Information for Disaster Management and Emergency Response (UN SPIDER).[148]

COPUOS and its UN service office, the UN Office of Outer Space Affairs (UNOOSA), have by default become the forum for some of the organizational functions normally performed by such specialized UN organizations as ICAO. A specialized body (committee or office) for asteroids could operate the way UNSPIDER acts for disaster management and emergency response. It could be a central data depository on asteroids and threatening NEOs data. It could administer and distribute all transparent data relating to asteroid mining thereby establishing greater certainty about mining activities and thus prevent conflicting asteroid plans. Greater certainty would benefit potential financiers who would then be motivated to finance commercial space operations.

IV. NEW TREATY INSTRUMENT(S) ON ASTEROIDS

The most straight forward approach to establishing order for asteroid activities would be to adopt new international law authorizing asteroid activities for specific purposes, including mining and diversion of NEOs. A treaty could be in the form of a comprehensive separate regime for asteroids or a protocol to an existing space law treaty such as the Outer Space Treaty, the Moon Agreement, or a treaty modeled on the ITU legal regime, or the INTELSAT Treaty.[149] A variation of this would be separate treaty instruments for each asteroid activity. For example, an NEO destined for known collision with Earth would provoke new international law allowing a country or a group of countries, possessed of the required technology, to divert an asteroid from its collision course. If the threatening asteroid is so big that its diversion requires use of nuclear power, such use could be made legal and an appropriate allowance in the Outer Space Treaty and the Nuclear

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[148] *Id*. See United Nations Platform for Space-based Information for Disaster Management and Emergency Response, G.A. Res. 61/110, U.N. Doc. A/RES/61/110 (Dec. 14, 2006); *see also* About UN-SPIDER, http://www.unoosa.org/oosa/en/unspider/index.html.

[149] Outer Space Treaty and the Moon Agreement, *supra* note 12; ITU, supra note 123; Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT), *entered into force* Feb. 12, 1973, 23 U.S.T. 3813, T.I.A.S. 7532; *see also* http://www.intelsat.com.

Test Ban Treaty could be made by separate treaty instrument. Secondly, if the earthly economy needs natural resources from mining of asteroids, then a separate and specific treaty allowance for such asteroid activity would be provided. Likewise, if and when an urgent need exists for diverting asteroids from their natural orbits as proposed by NASA, then a separate and specific treaty instrument for such an asteroid activity would be negotiated. Such separate, narrow treaty instruments would be negotiated when the need for each asteroid activity arises. This minimalist approach would allow specific activities while maintaining the balance of power created the Outer Space Treaty as much as possible. However, treaties may not develop swiftly enough to respond to exigencies in outer space.

A. Separate and Independent New Treaty Regime(s) on Asteroids

A new independent treaty on asteroids could contain all three activities discussed previously, that is, (1) a regime for mining asteroids including appropriation of natural resources, with possible removal of asteroids from orbit for mineral processing as well as for transfer of the refined minerals; (2) removal of asteroids from their orbit for exploratory purposes, such as planned by NASA; (3) diversion of NEOs by a number of methods, including possible use of nuclear power sources. A treaty could also be limited to any one of these three activities. If the latter approach is preferred, the issue of exercising control over asteroids[150] could probably best be accomplished by changing the Outer Space Treaty directly or by protocol, whereas issues relating to resource exploitation might best fit into the same category as a Moon Agreement protocol.[151]

A problem with a special treaty regime for asteroids would be that many, if not most, countries would consider the asteroid regime as a change to the Outer Space Treaty. They would view the treaty as a modification of their current rights of access under Outer Space Treaty, Art I; they would be particularly concerned about reduction of the scope of Outer Space Treaty, Art II, which

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[150] *See* section IV(B)(1), *infra*.
[151] *See* section IV(B)(2), *infra*.

totally prohibits appropriation of celestial bodies. They would also be concerned about possible use of asteroids for military purposes.[152] Several other States' rights and privileges existing under the Outer Space Treaty would be affected. Many of their concerns would be similar to their concerns about a special Protocol to the Outer Space Treaty discussed below.

A barrier to general acceptance of a special asteroid treaty could be that its approach would be counter to that which is generally accepted as customary international law, as codified in the Outer Space Treaty. There might have to be two legal regimes: The generally accepted regime of the Outer Space Treaty and then a special asteroid treaty accepted by a few. The situation would be somewhat similar to that which now exists with the limited acceptance of the Moon Agreement.[153] Most States would continue to insist on their perceived legal rights under the Outer Space Treaty.

B. The Protocol Approach

1. Protocol to the Outer Space Treaty

A special asteroid protocol to the Outer Space Treaty may appeal to States which, for commercial or for political reasons, do not want to proceed with the Moon Agreement's Art. 11(5) mandate to establish a new regime governing all the natural resources of the solar system. Such a protocol could be shaped to include not only exploitation of asteroid mineral resources but also changes in orbits of NEOs and other special issues relating to asteroids like emergency measures for NEOs. Furthermore, it could arrange minimum international coordination or administration. However, States that adhere to the view that asteroids are included in the Outer Space Treaty would not accept a competing Protocol.[154]

One approach to a new protocol might be for States simply to agree that asteroids are not subject to the Outer Space Treaty. However this approach would raise all kinds of questions. If not subject to this Treaty then what is the applicable law, if any? Such

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[152] *See* Outer Space Treaty, *supra* note 12, at art. IV.

[153] Moon Agreement, *supra* note 12. Only 15 countries have ratified or adhered to this treaty. The United States and Russia are not parties.

[154] *See* discussion *supra*, section II.

an approach might appeal to States wanting to exploit asteroids, but would probably not be acceptable to States not presently capable of exploiting asteroids. Thus the outcome could result in two regimes rather than a unified generally accepted regime.[155]

A second approach might be to resolve only ambiguities about the space law applicable to asteroids. The scope of the negotiations would have to be defined narrowly to asteroid issues. An attraction of this approach would be that the many States opposed to the Moon Treaty would seize on this opportunity to create a limited but more favorable regime for exploitation of asteroids. This protocol approach would provoke concerns about a reopening of the Outer Space Treaty for re-negotiation. Major pillars of the Outer Space Treaty would be modified. Many countries would view such changes as a deterioration of their current rights and privileges under the pillars of the Outer Space Treaty, Arts. I, II, and IV, as follows:[156]

> (a) Right of free access to all celestial bodies under Article I:[157] Most States and, in particular, the developing countries that have the majority of the votes in the United Nations, consider their treaty rights to free access to celestial bodies "irrespective of their degree of economic or scientific development" to be part of their future. They hope to make use of their rights in the future when they become economically developed. They would not want to relinquish that right at their present state of development.
>
> (b).Appropriation of celestial bodies under Art II:[158] The emphasis of Art. II is on appropriation which is a much broader concept than sovereignty; it includes the issue of sovereignty rather than the reverse. The prohibition on appropriation of celestial bodies and on assertion of national sovereignty in outer space was President Eisenhower's offer to the then-Soviet Union and the rest of the world in his famous speech to the United Nations in 1959.[159] Acceptance of this principle

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[155] *See* LYALL AND LARSEN, *supra* note 23, at 58.

[156] *See* discussion *supra*, section II.

[157] Outer Space Treaty, *supra* note 12.

[158] *Id*. at art II.

[159] Eisenhower, *supra* note 27. For text of his speech, *see* U.S. Senate Committee on Aeronautical and Space Sciences, Legal Problems of Space Exploration: A Symposium, (U.S. Government Printing Office [GPO] 1961).

meant an end to the race for the proverbial "high grounds" of outer space which was of great strategic military significance to both original space powers (USA and the then- USSR). Any change in Art. II could upset the present precarious balance of power in outer space. None of the current space powers, including the United States, Russia, or China, would want to disturb this fundamental principle for reasons of national security.

(c) Use of celestial bodies exclusively for peaceful uses: [160] Art. IV guarantees that celestial bodies may only be used for peaceful purposes. There can be no military installations on celestial bodies. Change of this principle would particularly disturb Russia and China, which for many years have wanted multilateral international agreement demilitarizing outer space including celestial bodies.[161]

(d) Change in the fundamental purpose of the Outer Space Treaty: Another reason why States do not want to open up the Outer Space Treaty to renegotiation is that this Treaty was intended to be a fundamental treaty on legal principles, like a constitution or a *magna carta* for outer space.[162] Implementation of those principles was intended for later treaties. The issue of asteroid mining is an issue of exploitation of natural resources which is essentially an issue of implementation.

2. Protocol to the Moon Agreement[163]

This discussion is limited to asteroids and does not encompass the wider scope of the Moon Agreement. The 1979 Moon Agreement, Art. 11(5), envisions the negotiation of a future regime on exploitation of outer space resources as soon as those resources are needed on Earth. Such a regime would encompass all solar system resources. The 1994 Protocol to the Law of the Seas Con-

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[160] *Id.*

[161] Russia and China have repeatedly proposed adoption of a treaty on prevention of an arms race in outer space (PAROS). The United States has opposed PAROS in the UN Conference on Disarmament, *see ASAT-ISFACTION: Customary International Law and the Regulation of Anti-Satellite Weapons*, supra note 62, at 1217. A change in Art. IV might also upset the Test Ban Treaty, *supra* note 49.

[162] *See* LYALL AND LARSEN, *supra* note 23, at 58.

[163] *See* discussion section II(C), *supra* on Moon Agreement.

vention (LOS)[164] presents one possible legal approach for mining and other commercial activities on asteroids. It would be like the legal right to use radio frequencies and orbital slots, allocated through ITU to national States, which would in turn license commercial operators of those rights.[165] The clear advantage would be that the holder of such a license could receive the unchallenged right to extract mining resources and conduct other commercial activities on the asteroids. The license would not amount to title. It would be a permission to exploit and use those resources.

As with the operators of commercial radio frequencies and orbital slots regulated by ITU,[166] the asteroid mining operators would be able to assure banks and financiers of the quiet enjoyment of the asteroid resources. The investment would be secure, which it would not be if the operator were to expect a challenge from competing operators from either the same or other States. Consequently, it would be in the interest of the current large space powers such as the United States, Russia, China, India, and Japan to negotiate and promote a regime on asteroid exploitation. Developing countries would receive the kind of benefits to which they are now entitled under the 1994 LOS Protocol. Therefore, such a regime would also be in their interest. Incidental to such a legal regime, States might also negotiate international emergency procedures for dangers to Earth from NEOs. In view of the expressed interest in conducting non-governmental activities on asteroids, "it would be desirable to have [an international regime] sooner rather than later."[167]

A protocol to the Moon Agreement including resources on the Moon and celestial bodies other than asteroids would be contentious because of the controversy surrounding use of lunar resources. The solution would have to be to bifurcate the protocol into two subjects (perhaps two separate protocols) and thus limit the scope of a new treaty instrument to asteroids.[168]

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[164] Law of the Sea Convention, *supra* note 76, and Law of the Sea, *supra* note 77.
[165] ITU, *supra* note 121.
[166] *Id.*
[167] BIN CHENG, *supra* note 37, at 665.
[168] *See* discussion section II(C), *supra* on Moon Agreement.

C. Other Treaty Models

1. ITU Model[169]

A new special treaty on asteroids could be negotiated to regulate exploitation of resources, including the possibility of changing the orbits of asteroids as well as bringing entire asteroids or parts of asteroids down to Earth for processing of natural resources. To accomplish such ventures, asteroid mining operators would seek exclusive rights to mining resources with right to possess and to sell those resources when refined. Therefore, some kind of international licensing regime would have to be established by the treaty. The treaty could create a resource allocation system to distribute rights to countries similar to the way ITU allocates radio frequencies and orbital slots. Such an allocation regime could be based on the operating principle of the ITU Constitution, Art. 44, stating that[170]

> Member States shall bear in mind that [asteroid mining resources] and any associated [asteroid] orbits …., are limited natural resources and that they must be used rationally, efficiently and economically in conformity with [international resource] regulations, so that countries or groups of countries may have equitable access to those [resources] and orbits, taking into account the special needs of the developing countries and the geographical situation of particular countries.

Authorizations could be issued by an international body similar to the Radio Regulations Board as described above in section III(C). Countries would then either retain those rights, seize an asteroid, and explore it, for example as proposed by NASA (seize an asteroid, divert its orbit, and place it into lunar orbit for closer examination), or national governments could issue licenses to non-governmental entities as is the practice with radio frequencies and orbital slots by the US Federal Communication Commission (FCC).[171]

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[169] ITU, *supra* note 121.
[170] *Id.*; ITU Const. at art. 44.
[171] *See supra* note 123.

The result would be to bring order to potential chaos. Such order would give confidence to banks and financiers to finance asteroid ventures.

2. Treaty on the INTELSAT Model

In 1964, and, finally in 1971, the majority of international telephone operators, through their governments, entered into the Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT).[172] The Agreement established an international body to manage a global communication satellite network. The organization was unusual because control, voting, share of contracts, and proportions of ownership of INTELSAT were based on contribution to cost rather than on one country one vote.[173] The final agreement went into force in 1973. The international organization created an Assembly of Parties in which each State had one vote and a Board of Governors in which most important decisions were made. The Assembly met biannually. The Board of Governors was a standing body in which most important decisions were made by weighted voting based on investment shares of which each held varying proportions.[174] INTELSAT was in effect an international cooperative organization of all the world's telephone companies, each of which held varying shares of ownership. Any telephone company from any participating State could join and participate in INTELSAT.

The INTELSAT model is relevant for asteroid management. Such a regime would favor the States making the largest investments. If applied to asteroid mining, an international cooperative would be formed in which all States or their designated commercial operators representing the State would participate with the objective of asteroid mining. Management and distribution of profits would be linked to national contributions to the cooperative. All States would be included. That would appeal to States which do not have outer space technology. A State could appoint more than one commercial operator to represent it in the governing body. Thus, a national monopoly on asteroid mining could be avoided.

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[172] INTELSAT Agreement, *supra* note 149. Note that INTELSAT has now been privatized.

[173] *Id.* at art. VII.

[174] *Id.* at art. IX.

An international agreement on the INTELSAT model could be limited to asteroid mining. It could also exercise the delegated function of collecting data on NEOs. It would not be suitable for remedial action regarding NEOs threatening Earth, nor for regulating changes in asteroid orbits.

V. RECOMMENDATIONS

A. Short Term Recommendations

In the short term the Outer Space Treaty applies to exploration, exploitation, and other uses of asteroids in outer space. On that basis, the following recommendations are made:

1.UN Charter: If a State in the future should want to divert a threatening NEO, it would be advisable first to inform and coordinate divertive action with the United Nations Security Council.[175]

2.Notification of UN Secretary General and States Parties to the Outer Space Treaty: Any future outer space activity constituting danger to life and health of astronauts requires informing the UN and States Parties. Keeping the UN informed would particularly apply to NASA's plan to send astronauts to examine the asteroid which NASA seeks to divert into lunar orbit.[176]

3. State Authorization to Engage in Asteroid Activities: The Outer Space Treaty, Article VI, would require the States Parties to the Treaty to specifically authorize any mining operations of non-governmental entities on asteroids. In order to assure compliance with the Outer Space Treaty, such States would be obligated continuously to supervise mining operations to assure continued Treaty compliance, and should do so.[177]

4.Registration of Satellites: Satellites used in outer space mining operations should be registered under the Registration Convention and the State of Registry should exercise continuing jurisdiction and control over the satellites and their personnel (astronauts).[178]

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[175] See U.N. Charter, Chapter VII, *supra* note 92.

[176] Outer Space Treaty, *supra* note 12, at art. V. *See also id.* art. XI (requiring States to keep the United Nations informed of their outer space activities "to the greatest extent feasible and practicable…").

[177] *Id.* at art. VI.

[178] *Id.* at art. VIII, and Registration Convention, *supra* note 12.

5. Environmental Controls: Governmental and non-governmental activities on asteroids should be operated "with due regard for the corresponding interests of all other States Parties to the Treaty" to avoid harmful contamination of asteroids. Asteroid operations should observe the Precautionary Principle.[179] States should also keep the UN Secretary General informed of the location and nature of their outer space activities to the greatest extent possible.[180]

6.Visits to Asteroid Facilities: All facilities on asteroids should be open to representatives of other States on the basis of reciprocity as required by Art. XII of the Outer Space Treaty.

B. Long Term Recommendations

There is currently a danger of legal chaos because the international space law on asteroids is uncertain. The Outer Space Treaty literally applies to all celestial bodies. There is no specific carve-out for asteroids. On the other hand, there is no specific inclusion either. Until recently, any uncertainty about the applicable law has not become an issue because there has not been an issue specifically relating to asteroid activities. That is now changing because of (1) declared commercial interest in exploitation (mining) of asteroids, including the possibility of changing orbits by bringing asteroids down to Earth; (2) NASA's plans to capture an asteroid and change its solar orbit into a lunar orbit; and (3) the perceived urgency to control NEOs after the 2013 Chelyabinsk experience.[181] Any and all of these possible events invite unilateral interventions. Suppose an asteroid containing gold or platinum is discovered and that discovery starts a so-called gold rush into outer space by private prospectors: All the prospectors will be frustrated by chaos until some order is established.

Furthermore, a threatening NEO strike on a large country like the United States, Russia, or China could motivate any of these countries to use available technology to divert the NEO from its natural course. Such a change of its natural orbit might merely divert a threatening NEO from one country to strike the territory

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[179] *Application of the Precautionary Principle to the Moon*, *supra* note 58.

[180] Outer Space Treaty, *supra* note 12, at art. IX.

[181] *Defenders of the Earth, supra* note 6.

of another country. If nuclear power is used, such an action might violate the prohibition on placing weapons of mass destruction in orbit and the Nuclear Test Ban Treaty.[182] Unilateral actions in non-sovereign outer space would need coordination by the international community. Issues relating to unilateral actions in outer space raise basic concerns about sovereignty violations and lead to claims of military dominion in outer space.[183] Considering the claims in the 2006 US National Space Policy Statement to right of unilateral action in outer space for the protection national assets in outer space,[184] this could be a provocative issue. In order to avoid legal chaos, it would be prudent to establish a rule of law before a significant NEO strike on Earth and before any unilateral changes of an asteroid's orbit, rather than after these events.[185]

In the very long term, States should consider adoption of a treaty instrument governing asteroids.[186] It is in the interest of the space powers to participate not only in the formation of new procedures for exploitation of asteroids but also in the administration of those procedures. The new procedures will govern their investments. The developing countries will also wish to participate in order to protect their future interests in space exploitation and to learn about relevant space technology.[187]

Uncertainty about the law governing asteroids and the danger of legal chaos regarding their use argue strongly for negotiation of a new treaty regime on asteroids. Christol[188] proposes the following guidelines for formation of an international agency, and the elements he describes are also relevant to asteroid exploitation:

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[182] Test Ban Treaty, *supra* note 49.

[183] *ASAT-ISFACTION: Customary International Law and the Regulation of Anti-Satellite Weapons*, *supra* note 62, at 1218-1219. David Koplow notes the difference in national space policy between the 2006 U.S. National Policy Statement and the 2010 U.S. National Space Policy Statement. The 2010 Statement seeks to avoid provocative activities in outer space. Consequently, the current political atmosphere is more favorable for international agreement than it was under previous U.S. space policy.

[184] *See* 2006 U.S. National Space Policy Statement.

[185] Koplow, *supra* note 8, at 302.

[186] *Id.* at 276.

[187] CARL Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 421. (Pergamon Press 1982).

[188] *Id.*

1. A clear mission of the agency of a technical rather than a political nature.

2. Membership open to participants on the basis of the size of their interests.

3. Organizational structure reflecting the participating nations' interest.

4. Minimum bureaucracy with small secretariat.

5. Low public profile to avoid political battles.

6. Regulation must not critically limit the participants' freedom to operate.

A number of options exist. The ITU model treaty works tolerably well for allocation of radiofrequencies with allocation of related communication satellite orbits. ITU has the reputation of being a technical rather than a political international organization. The advantage of this regime would be not only that it is tested but also that it could avoid stirring up debate over need for definition of the 'common heritage of mankind' which is the controversial obstacle of the Moon Agreement.[189]

A treaty on the INTELSAT model might be controversial because of its 'weighted' voting rights.[190] INTELSAT, before privatization, was considered to be a commercial rather than a political organization. In practice, INTELSAT did business by consensus. This approach to decision-making is well known because it is the existing practice in COPUOS. Nevertheless, the consensus in each instance was, and is, based on acknowledgement of the existing voting strength of the economically disadvantaged States. It is also an acknowledgement that no asteroid activities would take place without use of the technology and economic resources of the space powers. Both the developed and the economically disadvantaged States would be endangered by prospective collision of Earth with a large NEO. All States would want a space power

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[189] Moon Agreement, *supra* note 12, at art. 11(1). This issue caused political stalemate on acceptance of the Moon Agreement and delayed its follow-up protocol on allocation of resources.

[190] *See* discussion of INTELSAT model, *supra* section IV(C)(2).

with the means to divert the orbit of a large NEO away from Earth.

The most straightforward and clearest treaty model would be a new treaty along the model of the 1994 Protocol to the LOS Convention.[191] It would establish an administration that would allocate resources based on commercial principles without duty to share resources or technology. The new treaty instrument could either be an independent treaty or it could be a free-standing protocol to the Moon Agreement. The advantage of this approach would be that the holders of licenses would be assured possession so that financiers could confidently advance funds to finance asteroid activities. However, the purpose of the 1994 LOS Protocol is to allocate licenses for resource exploitation. It is not specially designed to authorize diversion and orbital changes of NEOs. Neither would it be particularly suited to authorize the kind of asteroid diversion planned by NASA (placing an asteroid into lunar orbit for exploration only).

We are coming closer to Bin Cheng's test for when international rules on exploitation of asteroids will develop. In his view, this will happen when (1) there is a perceived need for new rules, (2) a favorable international climate exists and (3) The major space powers are in agreement.[192] The need to establish order and to prevent chaos is strong motivation for new international rules.

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[191] Law of the Sea Convention, *sup*ra note 76, and Law of the Sea, *supra* note 77.

[192] BIN CHENG, *supr*a note 37, at 687.

APPLES AND ORANGES: WHY AIRCRAFT PROTOCOLS DON'T WORK IN SPACE

Louis Francis Rosa[*]

In 2001, the International Institute for the Unification of Private Law (UNIDROIT) sponsored the Convention on International Interests in Mobile Equipment (Cape Town Treaty, or the Treaty).[1] It recognized the global demand for internationally mobile, high-value assets and the corresponding need to standardize international recognition of security interests to facilitate international, asset-based finance.[2] The Treaty's drafters acknowledged different industries and assets require more individualized approaches. They identified the advantage of tailoring subsequent add-ons of the original Treaty to those industries' unique needs, paving the way for various later Protocols as additions.[3] These Protocols include the Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Aircraft Equipment[4] (Aircraft Equipment Protocol or AEP), the Protocol to the Convention on International Interests in Mobile Equipment on

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[1] Convention on International Interests in Mobile Equipment, opened for signature Nov. 16, 2001, 2307 U.N.T.S. 285 (*entered into force* Apr. 1, 2004), *available at* http://unidroit.org/english/conventions/mobile-equipment/mobile-equipment.pdf [hereinafter Cape Town Treaty]. The United States is also a party to the treaty. *See* Cape Town Treaty Implementation Act of 2004, Pub. L. No. 108-297, 118 Stat. 1095 (2004).

[2] *Id.*

[3] *See* Cape Town Treaty, *supra* note 1; *See also* Sir Roy Goode, *Extract from the Official Commentary, Convention on International Interests in Mobile Assets and Protocol Thereto on Matters Specific to Aircraft Equipment*, UNIDROIT Doc. C.G.E. SpacePr./1/W.P.4, at 2-4, UNIDROIT (Jun. 2003), *available at* http://www.unidroit.org/english/documents/2003/study72j/cge-session1/cge-1-wp04-e.pdf .

[4] Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Aircraft Equipment, *opened for signature* Nov. 16, 2001, T.I.A.S. No. 06-301.2, 2367 U.N.T.S. 615 (*entered into force* Mar. 1, 2006), *available at* http://www.unidroit.org/english/conventions/mobile-equipment/aircraftprotocol.pdf [hereinafter Aircraft Equipment Protocol].

Matters specific to Space Assets[5] (Space Assets Protocol or SAP), and the Luxembourg Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Railway Rolling Stock.[6]

The goal of the Treaty and its Protocols is to facilitate asset-based financing and increase availability of capital to international buyers by reducing financing costs through minimizing creditors' risk and increasing legal and financial certainty.[7] Together, they accomplish this by clarifying international laws regarding security interests and the rights and remedies available to creditors in the event of a debtor's default. The Aircraft Equipment and Space Assets Protocols try to facilitate international finance in substantially the same way, with closely similar language. Space assets and aircraft are both inherently mobile, regularly crossing international borders in both transit and in sale. In light of the Aircraft Equipment Protocol's success and widespread support,[8] it seems intuitive the space industry could also benefit from a similar protocol on mobile assets. Subscribing to this same idea, the drafters of the SAP acknowledge the AEP's influence on the Space Protocol's language as an effective means to achieve similar

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[5] Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets, opened for signature Mar. 9, 2012, *available at* http://www.unidroit.org/english/conventions/mobile-equipment/spaceassets-protocol-e.pdf [hereinafter Space Assets Protocol].

[6] Luxembourg Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Railway Rolling Stock, opened for signature Feb. 23, 2007, http://www.unidroit.org/english/conventions/mobile-equipment/railprotocol.pdf.

[7] *See* Timei Aganaba, *Assessing the Support for the Space Assets Protocol to the UNIDROIT Cape Town Convention, Study Report*, Reference No: IISC - 09 - P.12.1, at 2, THE INTERNATIONAL INSTITUTE OF SPACE COMMERCE (Dec. 16, 2009). http://www.iisc.im/documents/IISC_-_09_-_P.12.1%5B2%5D_1.pdf. ("The goal of the regime is thus to make financing available where it is not and, where it is, to permit one to buy and sell more cheaply through financing that minimizes the risks of financial loss.").

[8] *See* Status – Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Aircraft Equipment - Signatures, Ratifications, Acceptances, Approvals, Accessions, UNIDROIT, *available at* http://www.unidroit.org/english/implement/i-2001-aircraftprotocol.pdf (last visited Sept. 15, 2014) [hereinafter Status of the Aircraft Equipment Protocol]. As of the authoring date of this paper, there are 54 contracting states to the AEP. *Id.*

goals.[9] However, this paper contends the aviation and space industries are sufficiently different so as to effectively preclude translating the success of one protocol to the other by using almost identical means and language.

This article begins in Part I by briefly contrasting the two respective histories of the space and aviation industries to parse out foundational differences accounting for one Protocol's success and the other's dismal reception. To understand the polarized opinions regarding the two Protocols, Part II contrasts how each Protocol came into existence, noting a lack of industry support for one and industry as a driving force for the other. Part III identifies financial issues concerning the SAP, comparing its similar insolvency regime with the AEP and distinguishing the two conflicting and incompatible types of financing affected in the two Protocols. Lastly, this article concludes in Part IV.

I. A COMPARISON OF THE TWO PROTOCOLS - HISTORY

The Cape Town Treaty's success insofar as the Aviation Equipment Protocol is concerned begins with a stable historical foundation. The AEP drafters were able to build on the aviation industry's experiences spanning more than a century. Aviation's dense history includes decades of treaty-based international regulation, notably commercial regulation of air transportation according to the Chicago Convention of 1944 and its progeny, and the structure provided by the International Civil Aviation Organization (ICAO) as a United Nations agency.[10] In addition to well-received international treaty-based regulation, the aircraft industry enjoyed more than fifty years of successful national and international finance prior to the genesis of the space industry.

Since the 1950s, the Uniform Commercial Code (UCC) has provided guidance for aircraft transactions in the United States

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[9] *See* Paul B. Larsen, Brief Report on the Final Space Protocol, INTERNATIONAL INSTITUTE OF SPACE LAW (Mar. 9, 2012), *available at* http://www.iislweb.org /docs/2012_unidroit.pdf.

[10] Letter from Harold S. Burman, Office of Legal Adviser, U.S. Department of State, to Martin Stanford *Preliminary United States Views Concerning the Draft Space Assets Finance Protocol*, (Nov. 15, 2008), *available at* http://www.state.gov /documents/organization/138876.pdf [hereinafter Letter from Harold S. Burman to Martin Stanford].

requiring secured financing.[11] Prior to the Cape Town Treaty, the UCC and its concepts had five decades of marketplace testing, practical application to aircraft finance, and marked success in asset-based finance. The UCC's efficacy provided the opportunity for the AEP's drafters to build on market-tested concepts which had been successful in the United States for decades and to apply those concepts to the international aircraft market.

Aviation's lengthy history provides a stable foundation for the Aviation Equipment Protocol. A rich background of regulatory support and a veritable blueprint for commercial success from the UCC buttress the AEP as a popular international agreement. Together, the AEP's drafters are provided meaningful historical reference points and a platform for positive reception.

Contrastingly, the space industry lacks the aircraft industry's extensive and established background. Firstly, the aviation industry existed decades before the 1957 Russian launch of *Sputnik 1*, which is widely credited with inciting the "Space Race" and represents the birth of human interaction with space.[12] Later in 1962, a consortium of private companies and the United States government launched the first satellite for commercial use, *Telstar 1*.[13] By the time *Telstar 1* began the nascent commercial space industry, the aviation industry had already advanced to international commerce and been subject to the Chicago Convention on International Civil Aviation for almost two decades.[14]

Secondly, the space industry does not benefit from the same international treaty foundation the aircraft industry enjoys. Space-based commercial activity is minimally addressed in the 1967 UN Outer Space Treaty[15] and its four subsequent treaties.[16] No other international agreements govern space commerce in

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[11] *Id.*; *see generally Allen R. Kamp, Uptown Act: A History of the Uniform Commercial Code: 1940-49*, 51 SMU L. REV. 275 (1998).

[12] Office of the Historian, U.S. DEPARTMENT OF STATE, *Sputnik, 1957*, http://history.state.gov/milestones/1953-1960/Sputnik (last visited Sept. 16, 2014).

[13] HELEN GAVAGHAN, SOMETHING NEW UNDER THE SUN: SATELLITES AND THE BEGINNING OF THE SPACE AGE 188-198 (Springer-Verlag New York Inc.,1998).

[14] Convention on International Civil Aviation, *opened for signature* Dec. 7, 1944, 61 Stat. 1180, T.I.A.S. 1591, 15 U.N.T.S. 295.

[15] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

[16] Letter from Harold S. Burman to Martin Stanford, *supra* note 10.

ways comparable to the extensive treaty-based authority regarding aviation commerce. In comparison to ICAO, the only international regulatory body for space provides minimal guidance, authority, and regulation.

The International Telecommunications Union ("ITU") is a United Nations agency and, like ICAO, is a treaty-based regulatory body.[17] The ITU regulates the global use of radio spectrum, coordinates international satellite orbits, and helps to establish worldwide standards.[18] Although the ITU does provide the satellite industry with a level of structure, it is nominal at best and not analogous to ICAO's much more ubiquitous authority and influence over the global aviation industry. The ITU is concerned with a narrowly defined area of satellite commerce, whereas ICAO is involved in almost all aspects of aviation, including air navigation, infrastructure, flight inspection, international border crossing procedures, flight standards, measurement units, and standardizing passports.[19] ICAO also provides economic analysis of the global aviation industry, studies regulatory issues, makes policy recommendations to member states, and is involved in regulating international air transportation.[20] The aircraft industry benefits from ICAO guidance, standards, support, and regulation, but the satellite industry has no comparable international authority.

Taken together, the comparatively short duration of the commercial space industry's existence and its brief and sparse background in international treaty-based law portray it as an industry in its youth. The aircraft industry contrastingly benefits from over a century of existence, multiple international treaties on a variety of specific aviation subjects, international participation, and a strong central regulatory authority.

Comparing the space industry's germinal history to aviation's much lengthier and ubiquitous existence is a starting point for

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[17] INTERNATIONAL TELECOMMUNICATIONS UNION, ABOUT ITU, OVERVIEW , http://www.itu.int/en/about/Pages/default.aspx (last visited Sept. 15, 2014).

[18] *Id.*

[19] International Civil Aviation Organization, Welcome to the ICAO Machine Readable Travel Documents Programme, http://www.icao.int/Security/mrtd/Pages/default.aspx (last visited Sept. 15, 2014).

[20] International Civil Aviation Organization, Air Transport Regulation, http://www.icao.int/sustainability/Pages/economic-policy.aspx (last visited Sept. 15, 2014).

understanding the two Protocols' differing receptions. Both concern mobile asset industries, contain common language, and attempt to accomplish the same ends. Yet, they are met with two very different receptions and can have widely differing results.[21] History can provide further insight into the reasoning behind this discrepancy by tracing how the two Protocols came into existence. These two separate geneses are additional important points of contrast.

II. A COMPARISON OF THE TWO PROTOCOLS - GENESIS

Several factors provide the foundational underpinnings behind the AEP's success, which are not present in the SAP, contributing to the ultimate divergence in support for the two Protocols. At the AEP's inception, the aircraft industry was closely involved in the objectives and drafting of the Protocol. In fact, the industry itself heavily assisted in the genesis, drafting, and adoption of the AEP.[22] The Aviation Working Group, a consortium of aircraft equipment manufacturers and major international creditors including Boeing, Airbus, GE, Morgan Stanley, Citi Group, Goldman Sachs, and JP Morgan,[23] was the driving force behind the AEP.[24] Multinational aircraft manufacturers and creditors were heavily involved in the Protocol's drafting and provided sought-after input throughout the process of drafting.[25] From the beginning, UNIDROIT involved the aviation industry in drafting the Protocol and the aviation industry enthusiastically participated.[26]

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[21] *See infra* Part III.A.

[22] Many of the Aviation Working Group's recommendations became part of the eventual Convention. *See* UNIDROIT, Comments by the Aviation Working Group and the International Air Transport Association on the Revised Draft Articles of a Future UNIDROIT Convention on International Interests in Mobile Equipment, Study LXXII – Doc. 32, (1996), http://www.unidroit.org/english/documents/1996/study72/s-72-32-e.pdf [hereinafter Comments of the Aviation Working Group].

[23] Aviation Working Group, List of AWG Members, http://www.awg.aero /inside/members/ (last visited Sept. 15, 2014).

[24] *See generally* THE LEGAL ADVISORY PANEL OF THE AVIATION WORKING GROUP, ADVANCED CONTRACT AND OPINION PRACTICES UNDER THE CAPE TOWN CONVENTION (2008).

[25] Comments of the Aviation Working Group, *supra* note 22.

[26] *Id.*

The AEP owes part of its international success to the way it came about. The Aircraft Working Group identified a problem, organized the relevant international entities, sought government and industry involvement, and obtained consensus from those affected by the proposed AEP. Aircraft industry participants subject to the AEP were in support of its adoption because their input was included in the Protocol's final language.[27] In addition to the Protocol's widespread support, economic impact analyses further justified the AEP, confirming the Protocol's language would likely achieve its goals.[28] The Protocol's large number of signatories illustrates its economic advantages for both governments of the largest aviation industry participants, as well as governments of developing countries.[29]

The same cannot be said for the genesis and support of the Space Assets Protocol. Where the AEP resulted from the demands of an industry needing a treaty's support, the SAP resulted from little involvement by a space industry claiming a new Protocol was unnecessary, burdensome, and would have the opposite intended effect.[30]

Although leading industry experts such as Peter Nesgos, a satellite finance authority and coordinator of the UNIDROIT Space Working Group, were involved at various points in drafting the SAP, expert involvement is limited in the Protocol's final draft.[31] This may be the result of a concerted effort at a boycott by members of the satellite sector, hoping their lack of participation would cause the SAP drafting efforts to stall and terminate with no agreement on the issue.[32] While this appears to be a subversive

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[27] Walter Polt, *Repossession is Nine-Tenths of the Law, Boeing Helps Lead Cape Town Treaty Effort*, BOEING FRONTIERS (2004), *available at* http://www.boeing.com/news/frontiers/archive/2004/december/i_fof1.html. *See also* Assessing the Support for the Space Assets Protocol, *supra* note 7, at 3.

[28] Videm Linetsky, *Economic Benefits of the Cape Town Treaty*, NORTHWESTERN UNIVERSITY (2009), *available at* http://*www.awg.aero/assets/docs/economicbenefits ofCapeTown.pdf*; Anthony Saunders and Ingo Walter, *Proposed Unidroit Convention on International Interests in Mobile Equipment as Applicable to Aircraft Equipment Through the Aircraft Equipment Protocol Economic Impact Assessment*, UNIDROIT (2008), *available at* http://www.awg.aero/assets/docs/EIA.pdf.

[29] *See* Status of the Aircraft Equipment Protocol, *supra* note 8.

[30] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 7.

[31] *Id.* at 6.

[32] *Id.* at 4.

negotiating tactic, it may be reactionary as a result of UNIDROIT allowing the industry's concerns about the SAP to go disregarded. Moreover, industry representatives repeatedly voiced concerns and opposition to the SAP throughout the drafting phase, which lasted more than a decade. Regardless, the drafting continued, culminating in a completed Protocol for ratification.

Concerning the SAP, parties to UNIDROIT ultimately drafted the Protocol without input from the space industry to solve a problem the space industry claimed did not exist.[33] On the other hand, the AEP resulted from the global aircraft industry's demand, as well as efforts to draft the Protocol the aircraft industry spearheaded. As a result, the aircraft industry supports the Protocol it was heavily involved in drafting. Conversely, the space industry opposes a Protocol they were not involved in drafting, was completed contrary to their wishes, and the industry claims will have the opposite effect of what the SAP actually intends to accomplish.

III. CONCERNS REGARDING THE SPACE ASSETS PROTOCOL

The vast majority of the global space industry has opposed the SAP, including satellite operators, spacecraft manufacturers, launch service providers, and insurers.[34] They contend the SAP will overburden creditors and debtors with a new, unclear supranational layer of compliance and registration obligations instead of simplifying international finance.[35]

The SAP's critical reception comes from not only space assets manufacturers and operators but also from the financial industry supporting it.[36] According to some financiers, the SAP does little to impact risk and the cost of capital,[37] which goes against its entire purpose and makes it useless to creditors. Industry representatives claim the SAP will not benefit them, and "financial institu-

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[33] E-mail from Patricia Cooper, President, Satellite Industry Association, to Martin J. Stanford, Deputy-Secretary General, UNIDROIT (Nov. 3, 2009), *available at* http://www.esoa.net/upload/files/news/unidroit/200911sia.pdf.

[34] Letter from the Global Satellite Industry to Martin J. Stanford, Deputy-Secretary General, UNIDROIT (Dec. 9, 2011), *available at* http://www.esoa.net/upload/files/news/unidroit/20111209industryletter.pdf.

[35] *Id.*

[36] *Id.*

[37] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 7.

tions will not be persuaded by the Convention to commence or expand lending to the space sector."[38] Without advantage to creditors, debtors will likewise see little benefit in reduced cost of capital, which is the ultimate aim of the Cape Town Treaty and its subsequent Protocols.

A need to simplify the complicated international patchwork of secured transactions laws, recognition of creditors' rights, insolvency, and transfer of ownership provides the impetus for both Protocols. Both the AEP and the SAP attempt to reduce risk, increase financial certainty, reduce the cost of capital, and facilitate international transactions by clarifying those laws. The insolvency regimes of both Protocols play an important role in the way both purport to achieve their goals and seek to establish financial confidence. Because the insolvency schemas play pivotal roles, they are important points of comparison for both Protocols and impact the efficacy of each.

A. A Comparison of Insolvency Regimes

Airlines' notoriously razor thin profit margins and the frequency of industry insolvencies together evince the global demand for both cost-reducing measures and clear insolvency laws.[39] For example in 2011, the global passenger airline industry produced $598 billion in revenue but made a comparatively low $7.9 billion profit. This is a profit margin of 1.3%.[40] Additionally, several American airline companies have declared bankruptcy in recent years in the US alone,[41] which enjoys one of the world's largest

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[38] *Id.*

[39] *See* AVIATION POLICY AND PLANS, FEDERAL AVIATION ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION, FAA AEROSPACE FORECAST FISCAL YEARS 2012-2032 (2012), at 9 [hereinafter 2012 FAA AEROSPACE FORECAST]. *See also* Mark Nensel, *A4A: US Airlines 1H profits margins goes from "razor-thin" to "paper-thin"*, AIR TRANSPORT WORLD PLUS (Aug. 23, 2013) www.atwonline.com/associations.

[40] International Air Transport Association, 2012 Annual Review (2012) http://www.iata.org/about/Documents/annual-review-2012.pdf.

[41] *See American Joins Long List of Airline Bankruptcies,* ASSOCIATED PRESS, http://www.boston.com/business/articles/2011/11/29/american_joins_long_list_of_airline_bankruptcies/ (last visited Sept. 15, 2014) (With Delta's bankruptcy, four of the country's seven top carriers were under bankruptcy protection, which does not include a plethora of airline mergers and acquisitions prior to possible bankruptcy.). *See also* 2012 FAA AEROSPACE FORECAST, *supra* note 39, at 62.

airline consumer bases with 731 million annual passengers.[42] Both factors contribute to a systemically high level of financial risk for international airline creditors, highlighting the important role insolvency rules play in international aviation finance.

One primary basis for the AEP's success is the included choice of insolvency regime. The regime provides two alternatives for ratifying countries: the creditor-friendly Alternative A, and the debtor-friendly Alternative B. A 2009 study of the AEP's projected economic impact noted the Protocol resulted in a significant risk reduction, provided a given country implemented Alternative A.[43] The study focused on risk reduction in financing transactions and the correlated reduction in financing costs from shortening repossession delays.[44] The findings concluded that with repossession delays shortened from a worldwide average of 20 months to 60 days under Alternative A, some airlines could enjoy the equivalent of a credit rating upgrade, and the airline industry could save billions in the long term.[45] The study furthermore determined Alternative A provides the greatest economic benefit to both creditors and debtors.[46] Accordingly, almost all the AEP's signatories have chosen Alternative A.[47]

Shortening repossession delays is one central part of the AEP's cost-effectiveness. It is a starting point for comparing methods present in both Protocols but only effective for one.[48] Timely repossession means a creditor waits less time before repossessing when a debtor fails to pay. Then, the creditor can sell or dispose the repossessed asset promptly and recoup any investment in a shorter time period. Aircraft equipment repossession responds extremely well to this approach. But, space asset repossession is uncertain and can be a lengthy process. Together, repossession rights and remedies play an essential role in the AEP's economic impact. As a Protocol with similar language, the SAP includes much of the same rights and remedies. However, a shorter repos-

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[42] 2012 FAA AEROSPACE FORECAST, *supra* note 39, at 73.
[43] Linetsky, *supra* note 28.
[44] *Id.* at 3.
[45] *Id.* at 2.
[46] *Id.*
[47] *See* Status of the Aircraft Equipment Protocol, *supra* note 8.
[48] Linetsky, *supra* note 28.

session delay is but one example of the AEP's successful concepts not directly translatable to the space industry.

Article XXI of the SAP was introduced in the final draft for adoption and conspicuously absent from previous drafts. It is similar to the AEP's choice of insolvency regime and is an ostensible attempt at mimicking the blueprint for the AEP's success.[49] Comparing Article XXIII of the AEP and Article XXI of the SAP, the insolvency remedies for both Protocols contain strikingly similar language and largely the same substantive alternatives.[50] The Aircraft Protocol's influence on the Space Protocol is evident. The SAP allows for a choice of insolvency regime and although the language between both insolvency regime choices is similar, the end results may be substantially different.

One problem with the SAP's insolvency remedies is a contracting state must choose to apply the entirety of either Alternative A or Alternative B.[51] According to Alternative A, a debtor involved in an insolvency-related event must transfer possession or control of the space asset to the creditor.[52] The debtor must also transfer possession or control of their rights, including future revenue streams from the asset, to the creditor at the conclusion of a predetermined waiting period.[53] Possession or control over the space asset presents two different sets of issues than possession or control over the resulting revenue streams.

Transferring the asset's control or ownership raises questions regarding ownership and/or control of a space asset and the debtor's rights. If a given entity receives international and national regulatory approval to operate a space asset in a certain way for a given purpose and subsequently defaults, the creditor may ultimately receive ownership of the space asset. Without the regulatory approval to operate an asset, the creditor is left with largely useless collateral until either the creditor receives new regulatory approval or a different entity contracts to buy the asset.

Transfer of ownership becomes more problematic in an industry heavily involving national governments. Due to the nature of

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[49] Space Assets Protocol, *supra* note 5, at art. 21.

[50] *Compare* Space Assets Protocol, *supra* note 5, at art. 21, *with* Aircraft Equipment Protocol, *supra* note 4, at art. 11.

[51] Space Assets Protocol, *supra* note 5, at art. 41(4).

[52] *Id.* at art. 21.

[53] *Id.*

governmental involvement and the unique aspects of space, national security issues affect the space industry in ways they do not affect the aircraft industry. Aware of this, the drafters of the SAP included language allowing a contracting state to disregard any agreement that conflicts with laws or regulations regarding the export of controlled goods, technology, data and services, or national security.[54]

National security issues raise separate implications from other export-controlled goods. For example, the SAP's reporting requirements may make governments hesitant to publicly register their assets. The narrowly defined purposes of many space assets not only make their resale difficult but also make them unambiguously specialized in their use. For example, consider intelligence gathering equipment or "spy satellites." A governmental registration of an interest in certain types of equipment may indicate the space asset is involved in national security or intelligence gathering – something many governments prefer to keep secret.

This could discourage Governments from obtaining outside funding if undisclosed activity associated with intelligence satellites and national security would become public knowledge. Instead, it may incentivize various workarounds. The sensitive, and sometimes secretive, nature of national security issues can mean distinguishing between a private entity and a government operating as a commercial entity. This may not always be obvious or straightforward. This type of obfuscation is common and also legal in many countries and could have the potential to blindside creditors if such sensitive matters go unreported. Creditors may have a difficult time reselling the asset or be barred from transferring it to a buyer in any other country.

National security issues aside, transfer of ownership to the creditor in the event of insolvency is also independent of any licenses, insurance, intellectual property, or ground equipment.[55] Most of these issues involve national laws or export restrictions that may conflict with the SAP, preventing the treaty from en-

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[54] *Id.* at art. 26.

[55] *Frequently Asked Questions About the UNIDROIT Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Aspace Assets*, MILBANK SPACE SMART, MILBANK, TWEED, HADLEY & MCCLOY LLP (2011), http://www.milbank.com/images/content/6/4/6496/Milbank-Space-Business-Group UNIDROIT-FAQs-October-2011.pdf

compassing everything a creditor may need access to. Part of a space asset's definition involves all "installed, incorporated or attached accessories, parts and equipment and all data, manuals, and records relating thereto."[56] Theoretically, a creditor could come to own a debtor's sensitive intellectual property pursuant to the SAP if a contracting state's laws permit transfer.

If a certain country's laws do permit a debtor to transfer ownership of a space asset to a creditor for eventual resale under insolvency proceedings, but do not permit transferring ownership of the accompanying intellectual property or data and services, the asset may become unusable. This could force a creditor to sell such a space asset only to an entity subject to the laws of the contracting state if export controls prevent transferring the accompanying necessary intangibles. Even if an entity outside the contracting state can purchase the asset, the intellectual property, data, and services may not be transferable. This could make the sale of a so-restricted asset contingent on licensing the restricted intangibles, if licensing is at all possible. It could alternatively diminish the space asset's value substantially if the asset must be sold without necessary accompanying accouterments.

These kinds of issues associated with repossession arise uniquely with space assets and are readily distinguishable from the issues creditors subject to the AEP face. For example, aircraft can be repossessed, deregistered, and flown back to the creditor's country with comparative ease. The Chicago Convention makes it relatively simple to register an aircraft and fly it internationally without having to consider many of the aforementioned implications of space asset repossession and sale. Aircraft are not subject to international permits or registration. Commercial aviation typically does not involve sensitive or proprietary information, data, services, intellectual property, or national security issues.

Airlines are tightly regulated, consumer-focused, and operate with low profit margins. Therefore, the industry's financial performance is weak, and the credit risk and costs for airline finance is increased.[57] Such weak financial performance serves to under-

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[56] Space Assets Protocol, *supra* note 5, at art. 1(2)(k)(iii).

[57] HOLMAN, FENWICK, WILLAN, LLP, UNIDROIT Draft Space Assets Protocol, (Feb. 2012), at 3, http://www.hfw.com/UNIDROIT-Draft-Space-Assets-Protocol [hereinafter SAP Client Brief].

score the AEP's vital importance. On the other hand, commercial satellite operators typically generate strong financial performance and are highly profitable. This supports the space industry's contention holding the SAP is largely unnecessary.[58] Financial risk is substantially different in the aviation and space industries, which shapes the ways in which both industries are financed.

B. Asset-Based Finance vs. Project-Based Finance

Due to the relative ease of repossession, the mechanics of aircraft financing lends itself to asset-based financing, which is the method of finance the Cape Town Convention is designed for and the costs of which the Convention aims to reduce.[59] The entire AEP was constructed around the principles of asset-based financing, even mentioning this type of financing by name in its language.[60] Even though the SAP shares substantially the same language as the AEP and both Protocols focus principally on facilitating asset-based financing, this type of financing does not drive the space industry.[61]

On a basic but ubiquitous level, asset-based financing involves a lender supplying capital to a debtor for the purchase of an asset. In return, the lender receives a security interest in the asset, allowing the creditor to retake possession and sell the asset to recoup losses if the debtor defaults. This type of financing depends heavily on an asset's long useful lifetime, an expeditious, uncomplicated repossession if a debtor defaults, and a secondary market for creditors to sell to if the need for repossession arises. None of these typically apply to the space industry, which vitiates asset-based financing's relevance to the space sector.[62] This accordingly prohibits the Cape Town Convention, which is predicated on facilitating asset-based financing, from applying to the space industry. In fact, the wholly different method of project-based financing works uniquely well for capital intensive and high-risk ventures not preferring asset-based financing, which neatly encapsulates the space industry.

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[58] *Id.*
[59] Aircraft Equipment Protocol, *supra* note 4, at art. 36(2)(a).
[60] *Id.*
[61] SAP Client Brief, *supra* note 57, at 2-3.
[62] *Id.*

Project-based financing can be defined as "the raising of finance on a Limited Recourse basis, for the purposes of developing a large capital-intensive infrastructure project, where … repayment of the financing by the borrower will be dependent on the internally generated cash flows of the project."[63] Under project-based financing, payment to creditors stems largely or entirely from projected revenue streams resulting only from the project itself. For example, a consortium of creditors may agree to finance construction and launch of a satellite for a telecommunications company. In return, they are guaranteed a part of the projected revenue stream coming from the satellite's operation.

Fundamentals of the space sector include incredibly capital-intensive design, construction, launch, and operation of space assets. Even more nuanced challenges associated with space asset ownership include transfer of ownership, control, and operation. Any space industry undertaking also includes a high level of risk associated with failure on launch, failure in space, and liability, which is typically more risk than any single creditor can feasibly take on. For these reasons, project-based financing is ideal for the space industry because it diffuses both the characteristically high risk and expenses among many different creditors. This partially explains why asset-based financing is inapplicable and is why revenue streams drive much of the space industry's development and operation. The revenue resulting from the debtor's operation of the space asset secures a creditor's repayment and profits, as opposed to security interests and repossession rights based on the asset's intrinsic value. Not only is project financing a fundamentally different approach to financing, it is subject to different economic and financial principles than asset-based finance.[64] This correspondingly means that approaches proving effective for one type of finance may not work well for the other.

According to results from an International Institute of Space Commerce survey assessing support for the SAP, the space finance industry bases the price of credit on the predicted future cash flows of a project or owning company, as opposed to the value

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[63] David Garner and James Wright, *Project Finance*, at 1, HSBC (2010), http://www.hsbcnet.com/gbm/attachments/products-services/financing/project-finance.pdf.

[64] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 5.

of the asset itself.[65] A given space asset, such as a satellite, typically holds little intrinsic value to creditors in comparison to projected revenue streams from that satellite. To illustrate the disparity in value, revenue streams over a satellite's usable life regularly exceed the value of the satellite itself by a ratio of 8:1, making asset-based finance a significantly weaker vehicle for space sector capital.[66] Space assets also typically involve operator licenses subject to national governmental approval and are usually not transferable or assignable, which significantly diminishes resale value for satellites.[67] Space assets such as satellites are also commonly designed for narrowly specific applications, requiring specialized expertise and knowledge in operating them, which further restricts the pool of possible buyers upon resale in the event of a default.[68]

Together, these factors effectively preclude any secondary market for space assets.[69] Without a residual value a creditor can depend on in the event of insolvency, little benefit can be realized in transferring ownership or control of a space asset to a creditor in the event of a debtor's insolvency. This, coupled with the higher value of satellite revenue streams explains why less than 1% of satellite finance is asset based.[70] The aircraft industry by comparison enjoys a healthy resale market, which the National Aircraft Resale Association pegs at 2,000 jet aircraft per year in a market worth $10 billion for business jets alone, which makes no mention of commercial aircraft.[71] This makes interests in physical aircraft themselves comparably more valuable and attractive to creditors who are able to resell any repossessed aircraft.

An illustrative example of the systemically low value placed on interests in physical satellites is Iridium, one of the first satellite companies providing handheld satellite telecommunications.

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[65] *Id.*

[66] *Id.*

[67] SAP Client Brief, *supra* note 57, at 2.

[68] *Id.*

[69] *Id.*

[70] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 7-8.

[71] NATIONAL AIRCRAFT RESALE ASSOCIATION, Report to the Aviation Community (2012), www.cfsjets.org/pdf/report.pdf.

Iridium declared Chapter 11 bankruptcy in 1999.[72] As a system that hinged on the interdependence of an entire network of 66 satellites, in addition to associated ground equipment, Iridium's bankruptcy embodies the mutualism typically encountered in project-based space finance. Without all parts of the system functioning together, a singular part of the system may end up being of little worth to a creditor.

The true value to creditors lays in future contracts involving the project in its entirety as a concept of the *gestalt*, with creditors able to sell a functioning and revenue-generating service if the debtor defaults.[73] Satellites dependent on corresponding ground equipment to generate revenue may be largely worthless without that equipment. Absent such necessary appurtenances, a creditor may be left owning a space asset that is useless by itself and located several thousand miles away without a market to sell the asset to. These exact circumstances surrounded Iridium. The satellite network was in orbit and functioned but the associated terrestrial handsets failed to gain widespread market acceptance. Once valued at over $5 billion in assets, Motorola sold the insolvent Iridium company and the entire network of 66 satellites in 2001 for around $25 million.[74]

Because the risk associated with financing space assets is unique, the Cape Town Convention's main benefit as a treaty focused on improving asset-based financing may not be realized. The Convention and associated Protocols focus on and attempt to address risks arising from asset-based finance but do not and cannot impact the unique risk incumbent in space asset financing. For example, a Protocol can do little to ameliorate the often-technical hazards associated with space asset launch, maintenance, hardware failure, liability, and operation. As such and aside from the shortcomings of addressing an entirely separate method of finance, the SAP does little to reduce overall risk. Therefore, it does not affect the price of capital and accordingly

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[72] See *Iridium IP LLC v. Motorola, Inc.* (*In re Iridium Operating LLC*), 373 B.R. 283 (Bankr. S.D.N.Y. 2007) for a brief history of the Iridium system and business model, as well as the ensuing bankruptcy petition.

[73] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 5.

[74] Craig Mellow, *The Rise and Fall and Rise of Iridium,* AIR & SPACE MAGAZINE, SMITHSONIAN INSTITUTION (Sept. 2004), http://www.airspacemag.com/space-exploration/iridium.html.

confers little benefit, if any, on parties involved.[75] Unable to reduce perils associated with actual space assets, the SAP includes language incorporating the debtor's right to payment of future obligations into the ambit of the Protocol.[76] The aim is to recognize a creditor's interest in the cash flows resulting from the debtor's operation of the space asset independent of a creditor's interest in the space asset itself.

The SAP language protecting a creditor's interest to future cash flows partially identifies the nuances of project finance and its application to space assets. However, it ultimately provides little added advantage. The Protocol requires signatories to adopt one of the insolvency regime alternatives in its entirety, which in the event of a debtor's insolvency may provide a creditor ownership of or control over a space asset they may not want or be able to operate for an extended period of time while regulatory approval is obtained.[77] Problematically, the transfer of space assets to creditors is irrespective of ground equipment.[78] With Iridium as the paradigm, those space assets may become useless without necessary accompanying hardware. In a different scenario, if a separate entity comes to own or possess the necessary associated ground equipment, a space asset financier may then find itself dependent on an entirely different entity to recoup its investment.

In addition to the insolvency regime's inapplicability to an industry with different circumstances and an entirely different finance model basis, concomitant issues unique to the SAP exist and remain points of contention for the global space industry.

C. Additional Concerns With the Space Assets Protocol

One of the space industry's primary apprehensions deals with the priority of competing rights in the context of exercising default remedies.[79] Article 17 of the SAP prohibits a creditor from enforcing their international interests in a space asset that is physically

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[75] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 5.

[76] Space Assets Protocol, *supra* note 5, at art. 21, art. 1(2)(a).

[77] Space Assets Protocol, *supra* note 5, at art. 21.

[78] *Id.*

[79] E-mail from Patricia Cooper, President, Satellite Industry Association, to Martin J. Stanford, Deputy-Secretary General, UNIDROIT (Apr. 15, 2010), at 2, Annex I, Page 2 (on file with author).

linked to another if exercising their right to enforce interests interferes with the operation of another space asset that was registered first.[80] This scenario introduces conflict because it could guarantee creditors or owners of component parts, for example certain antennae on a given satellite, receive a right to quiet enjoyment and noninterference.[81] This means an owner of a satellite or component may be powerless to exercise ownership rights over it if other components may be affected. For example, consider a scenario in which a satellite must be repositioned or changing an antenna's beam angle may interfere with another component's operation. Where these types of issues are typically handled on a case-by-case basis through negotiation,[82] the SAP could contrarily impose a blanket ban. Instead of negotiating and reaching an agreement, one of the component owners may come into disproportionate control to the detriment of other component owners, asset owners, or operators.

An additional major point of contention is the inclusion of "public services" in the final SAP document.[83] The satellite industry's main worry was that Article 17(3) prevents a creditor from exercising default remedies over a space asset for a predetermined period of time that is needed for provision of a public service if it would interfere with the provision of that public service.[84] For example, a creditor of a satellite with a single component providing a public service would be unable to exercise ownership rights for a certain time if it interfered with that public service.

Even more problematically, the term "public service" remains without a clear definition. Public services could intuitively include emergency satellite telecommunications, weather coverage, remote sensing, or military telecommunications. It could also en-

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[80]Space Assets Protocol, *supra* note 5, at art. 17(3).

> Unless otherwise agreed, a creditor may not enforce an international interest in a space asset that is physically linked with another space asset so as to impair or interfere with the operation of the other space asset if an international interest or sale has been registered with respect to the other space asset prior to the registration of the international interest being enforced.

Id.

[81] E-mail from Patricia Cooper to Martin J. Stanford, *supra* note 79.

[82] E-mail from Patricia Cooper to Martin J. Stanford, *supra* note 79, annex 2, p. 2.

[83] Space Assets Protocol, supra note 5, at art. 27(3).

[84] E-mail from Patricia Cooper to Martin J. Stanford, *supra* note 79, at annex 1, p. 2-4.

compass the occasional emergency-only use of a single transponder, or a nationally important live event, or newsgathering.[85] Different countries may also contemplate the definition in differing and possibly conflicting ways, leading to a patchwork of interpretations, which is the very situation that the Protocol aims to prevent.

With a wide range of definition for public service and a strict prohibition on interference with those services for up to six months after an insolvency-related event,[86] creditors may reconsider extending financing in light of risking inability to exercise ownership rights in the event of a default. This may come to affect an entire satellite and many other different component owners if even just one of them provides a public service. Article 17(1) and (2) mitigate the uncertainty to a degree by permitting a notice in the registry of a public service status, however with the possibility of diminished ownership rights in the event of a default, creditors may be keen to shy away from being involved in a space asset, space asset component, or space asset with a component involving a public service notice. In this case, the SAP muddies the proverbial waters because most countries already impose operating conditions or requirements on communications service providers related to matters of emergency, national security or related communications.[87]

Additionally, qualification as a public service may require the creditor to comply with greater financial obligations. If the creditor exercises the right to assume control in the event of default,[88] it may be subject to new and costly regulatory, legal, and commercial obligations.[89] It could also mean a greater exposure to liability as the provider of a public service such as emergency response.

The length of delay in exercising creditor's rights presents another issue with the public service provision. The six month waiting period is much longer than the AEP's waiting period of only 60 days. Considering the lion's share of financial benefits stemming from the AEP's similar insolvency regime results from

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[85] *Id.*
[86] Space Assets Protocol, *supra* note 5, at art. 27(4).
[87] E-mail from Patricia Cooper to Martin J. Stanford, *supra* note 79, annex I, p. 3.
[88] Space Assets Protocol, *supra* note 5, at art. 27(5).
[89] Letter from the Global Satellite Industry to Martin J. Stanford, *supra* note 34.

reducing the repossession delay from an average of twenty months to 60 days, this removes much of the SAP's attempted advantages.[90]

IV. CONCLUSION

The Cape Town Convention on Interests in Mobile Equipment concerns mobile assets that regularly cross borders in both operation and sale.[91] Space assets and aircraft equipment intuitively fall into this category, and thus creation of a Protocol concerning both industries vis-à-vis the Cape Town Treaty ostensibly stands to reason. The AEP is widely regarded as an international success[92] and stands as a testament to this reasoning. As this article illustrates, the SAP on the other hand exemplifies the pitfalls in applying a "one size fits all" approach to two industries that may share outward similarities, but instead have distinguishing idiosyncrasies that thwart such an approach.

Prior to the AEP's adoption, an extensive economic impact assessment sought to determine if the AEP would achieve the benefits it purported to bestow.[93] Subsequently, several analyses have augmented this claim[94] and the Organization for Economic Cooperation and Development (OECD) even provides export credits for countries adopting preferential AEP provisions.[95] On the

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[90] Linetsky, *supra* note 28.

[91] Cape Town Treaty, *supra* note 1.

[92] The extensive ratification speaks to this international success. *See* SAP Client Brief, *supra* note 57, at 6.

[93] Linetsky, *supra* note 28; Saunders and Walter, *supra* note 28.

[94] *See generally* E-mail from Jeffrey Wool, Secretary General, Aviation Working Group, to Rachel Onikosi, Deputy Head, Department for Business, Innovation, and Skills (Aug. 16, 2010), http://www.awg.aero/assets/docs/AWG%20-%20DBIS%20-%20Cape%20Town.pdf, (expounding on the economic advantages incumbent in Alternative A of the AEP). *See also* Anthony Saunders, et. al., *Innovation in International Law and Global Finance: Estimating the Financial Impact of the Cape Town Convention*, NEW YORK UNIVERSITY STERN SCHOOL OF BUSINESS (2006), http://archive.nyu.edu/bitstream/2451/26364/2/FIN-06-001.pdf, at 30 ("we find that the average country in the data sample would save, in aggregate, between $7.6 billion and $11.1 billion over the 20-year estimation period, and that the average low-income country would save between $4.6 and $6.8 billion…between 2004 and 2023").

[95] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, Sector Understanding on Export Credits for Civil Aircraft, Annex III, OECD Doc. TAD/PG(2011)3, (Feb. 1, 2011), at 33, http://www.oecd.org/officialdocuments/displaydocumentpdf?cote=tad/pg(2011)3&doclanguage=en.

contrary, where the AEP benefitted from detailed economic impact analyses, the SAP lacked a single economic impact study prior to completion. Where the AEP enjoys support from the OECD and the biggest aircraft manufacturers and financiers in the world, almost all of the global space industry has voiced reservations.[96] Additionally, 46 countries have signed and ratified the AEP, most of which contain the largest entities in the aircraft equipment manufacturing and aircraft finance industries.[97] Compare this figure with the amount of countries that have thus-far signed the SAP as of this article's completion, which stands at four.[98] Signatory countries include Saudi Arabia, Burkina Faso, and Zimbabwe; none of which are major spacefaring countries.[99] Furthermore, the number of countries actually ratifying the SAP remains at zero.[100]

Although the final text of the SAP was adopted only months prior to this article, the Protocol has not been adopted by any major spacefaring nations or any states heavily involved in space asset construction and finance. Moreover, the United States, which falls into the two previous categories, has withdrawn support for the SAP and will not likely be a party to it.[101] European space industry representatives have also voiced contention with the Protocol, reducing the chance of adoption there as well.[102] It is additionally clear that the UK government will not be ratifying the SAP either.[103] In all, 45 satellite operators from every major

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[96] Letter from the Global Satellite Industry to Martin J. Stanford, *supra* note 34, *see also* E-mail from Patricia Cooper to Martin J. Stanford, *supra* note 79; EUROPEAN SATELLITE OPERATORS' ASSOCIATION, Global Satellite Industry Denounces UNIDROIT Protocol, (Mar. 9, 2010), http://www.esoa.net/upload/files/news/20120309_PR_UNIDROIT.pdf; s*ee also* UNIDROIT Space Protocol Workshop, Summary, UNIDROIT (Feb. 9, 2011) http://www.space-institute.org/wp-content/uploads/2011/01/UNIDROIT-Space-Protocol-Workshop-Summary-final.pdf.

[97] Status of the Aircraft Equipment Protocol, *supra* note 8.

[98] Status of the Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Space Assets, UNIDROIT (Nov. 2012), www.unidroit.org/status-2012-space.

[99] *Id.*

[100] *Id.*

[101] Burman, *supra* note 10.

[102] ESOA's Consideration of the UNIDROIT Space Assets Protocol, THE EUROPEAN SATELLITE OPERATORS ASSOCIATION (May 2010), http://www.esoa.net/upload/files/news/unidroit/201005esoa.pdf.

[103] SAP Client Brief, *supra* note 57, at 6.

spacefaring nation; twelve spacecraft manufacturers including Boeing, Mitsubishi and Lockheed; 17 space insurers; and eleven major space industry financiers including Goldman Sachs, Morgan Stanley, Deutsche Bank, UBS, Barclays, and a multitude of other international financiers have all voiced vehement opposition to the SAP.[104] Those involved in the space industry point to the fact that throughout the ten years while the SAP was being drafted, the space industry was well financed and none in the industry voiced a need for a Protocol such as the SAP.[105]

Although Article XVI permits derogation and a departure from the black letter of the Protocol's language, a substantial amount of deviation would be required to accommodate all of the identified issues within the SAP.[106] This inefficacy raises the question of whether or not it is worth acceding to the SAP in the first place. With so many and such crucial participants in the global space industry justifiably opposing the SAP, it seems for any countries heavily involved in the space industry, the answer to that question is no.

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[104] Letter from the Global Satellite Industry to Martin J. Stanford, *supra* note 34.
[105] Assessing the Support for the Space Assets Protocol, *supra* note 7, at 4.
[106] Space Assets Protocol, *supra* note 5, at art. 16.

REFORMING REGULATION OF BASIC AND SMALL BUSINESS RESEARCH AND EDUCATION IN SPACE TECHNOLOGIES UNDER ITAR (INTERNATIONAL TRAFFIC IN ARMS REGULATIONS) AND EAR (EXPORT ADMINISTRATION REGULATIONS)

*Jeremy Straub**, *Joseph J. Vacek, J.D.***

I. INTRODUCTION

The export of and access to space technology items in the United States is controlled domestically by two sets of regulations, the International Traffic in Arms Regulations (ITAR)[1] and the Export Administration Regulations (EAR)[2]. The former regulates items deemed to have significant military application while the latter regulates items whose utility is primarily or significantly

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[1] 22 U.S.C. §2778 *et seq*.

[2] 50 U.S.C. §1701; 50 U.S.C. §2401.

civil. From that reference frame, this paper notes that the United States is confronted by a world where adversaries take a variety of forms: state actors (including perhaps current allies at a future point), organized non-state militants and ad-hoc collections of individuals. These groups and individuals seek, in some cases, to undermine the mechanisms of security that allow the prosperous civil society experienced by the United States and its allies. Keeping the tools required to do this away from these individuals is thus not just a legitimate function of government, but a necessity, if the nation aims to maintain its current political and economic status. The United States also must continue to develop new technologies to maintain this technical advantage into the future; resting on current technical laurels is perhaps the best way to end up unprepared for future conflict. Preventing bad actors from obtaining advantageous technologies must be balanced with enough legal protection and financial incentive for domestic inventors to do research and development and bring their products to market. In order to encourage the development of new technologies, it is necessary to allow their creators to access the markets required to sell them and to be free of unnecessary fear of governmental prosecution when doing so.

Recent changes to the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR) have moved in that direction. Items from the more restrictive ITAR have been moved to the less restrictive EAR, which is helpful for those looking to sell technologies abroad. However, for those who have no desire to sell or export items yet (or perhaps at all), these changes have had little impact on the legal risks they face domestically.

This paper proposes and analyzes several changes to the ITAR and EAR which would enable bona fide academic research activities and provide a "safe harbor" to small business firms and individuals conducting research or business and attempting in good faith to comply with ITAR and EAR but unintentionally violate a technical regulation which results in a non-impactful violation. The proposed changes create greater certainty about where the line between allowed and prohibited activities lies and reduces the legal risk of being prosecuted for an unintentional and non-impactful technical violation.

II. BACKGROUND

Export control regulations are, by no means, a construct of the United States. Crook[3] provides a historic example from sixteenth century Europe where foreigners found in possession of sensitive navigation information were immediately put to death; if this information was found on a ship, the ship was destroyed and the entire crew executed. Evans and Valdivia[4] proffer that the current U.S. export control regime is a product of Cold War necessity that has not been revisited to update it to current day conditions. They question whether the society's role under the so-called Social Contract for Science (which promises benefit in exchange for giving scientists the freedom to explore) is currently being met, particularly given the lack of benefit that appears to be derived from the regulatory regime.

The export of and access to space technology items in the United States is controlled by two sets of regulations, the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). ITAR regulates items deemed to have significant military application while EAR regulates items whose utility is primarily or significantly civil. Both sets of regulations are discussed in detail below.

A. (ITAR) International Traffic in Arms Regulations

The authority for ITAR primarily stems from 22 U.S.C. §2778 (the Arms Export Control Act) and is enacted via 22 C.F.R. §120-130 (the International Traffic in Arms Regulations). From §123.1, "any person who intends to export or to import temporarily a defense article must obtain [approvals, except if an exemption applies][5]. These regulations apply "to the export of technical data and the export of classified defense articles" excluding "information which is in the public domain."[6]

The intent of ITAR is to "protect the economic, military and, diplomatic interests of the United States"; however Robinson and

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[3] Jason A. Crook, *National Insecurity: ITAR and the Technological Impairment of U.S. National Space Policy*. 74 J. OF AIR L. AND COM. 505-526 (2009).

[4] Samuel A. W. Evans & Walter D. Valdivia, *Export Controls and the Tensions Between Academic Freedom and National Security*, 50 MINERVA 169-190 (2012).

[5] 22 C.F.R. §123.1.

[6] 22 C.F.R. §125.1.

McAdamis contend that the regulations have been "self-defeating with respect to these goals".[7] Crook[8] proffers that ITAR has impeded both the economic competitiveness of the U.S. aerospace industry and U.S. space policy in general. Robinson and McAdamis also contend that, in addition to creating "an environment of debilitating confusion", it represents a lack of awareness regarding the "absolute critical importance of maintaining and enhancing ongoing 'basic research'".[9] Crook[10] notes that funds spent on "guarding non-essential items, such as Bigelow Aerospace's 'metal coffee table'" are funds that could otherwise be spent on more beneficial activities such as research and development.

Per §120.17(a), exports include both actions that would be typically be perceived as exporting such as "sending or taking a defense article out of the United States in any manner" (excluding knowledge known to an individual who is personally traveling) and transferring ownership of an item to a foreign national. They do not, however, include launching a rocket into space, despite this resulting in the removal of controlled items from U.S. territory. However, they do include merely providing information, irrespective of whether the information even leaves the United States[11]:

> (3) Disclosing (including oral or visual disclosure) or transferring in the United States any defense article to an embassy, any agency or subdivision of a foreign government (*e.g.,* diplomatic missions); or
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> (4) Disclosing (including oral or visual disclosure) or transferring technical data to a foreign person, whether in the United States or abroad.

Some types of work can also be included in this definition. ITAR implications exist for[12]:

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[7] George S. Robinson & Eric McAdamis, *International Space Exploration and Critical Transparency of Basic Research: Impact of the U.S. International Traffic in Arms Regulations*, 34 J. OF SPACE L. 357-410 (2008).

[8] Crook, *supra* note 3.

[9] Robinson & McAdamis, *supra* note 7.

[10] Crook, *supra* note 3.

[11] 22 C.F.R. §120.17(a).

[12] 22 C.F.R. §120.17(a).

> (5) Performing a defense service on behalf of, or for the benefit of, a foreign person, whether in the United States or abroad.

With a definition for export, attention now turns towards defining the categories of items that can be exported. A defense article, per §120.6, includes "any item or technical data" included in § 121.1 or which can be regulated under § 120.3. It also includes "technical data recorded or stored in any physical form" including items that merely "reveal technical data" about a controlled item. However, it excludes some marketing and descriptive data. The referenced section, §121.1, contains the United States Munitions List (USML), a listing of controlled items.[13]

A defense service is currently defined by §120.9, as providing training or other assistance to "persons, whether in the United States or abroad in the design, development, engineering, manufacture, production, assembly, testing, repair, maintenance, modification, operation, demilitarization, destruction, processing or use of defense articles", providing "technical data" controlled under ITAR or providing "military training", the definition of which includes providing "information publications and media of all kinds" or "military advice".

The proposed rule[14] (78 FR No. 101 31448-31449) changes this to:

> (1) The furnishing of assistance (including training) using other than public domain information (*see* § 120.11 of this subchapter) to a foreign person (*see* § 120.16 of this subchapter), whether in the United States or abroad, in the design, development, engineering, manufacture, production, assembly, testing, intermediate- or depot-level maintenance (*see* § 120.38 of this subchapter), modification, demilitarization, destruction, or processing of defense articles (*see* § 120.6 of this subchapter);
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> (2) The furnishing of assistance to a foreign person, whether in the United States or abroad, for the integration of any item controlled on the U.S. Munitions List (USML) (*see* § 121.1 of

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[13] 22 C.F.R. §121.1.

[14] The interim final rule for USML Category XV (79 FR No. 92 27181), the preliminary rule for which was also contained within the proposed rule notice that redefines defense services, indicated a final rule redefining defenses was still forthcoming.

this subchapter) or items subject to the EAR (*see* § 120.42 of this subchapter) into an end item (*see* § 121.8(a) of this subchapter) or component (see § 121.8(b) of this subchapter) that is controlled as a defense article on the USML, regardless of the origin.

Note to paragraph (a)(2): "Integration" means the systems engineering design process of uniting two or more items in order to form, coordinate, or blend into a functioning or unified whole, including introduction of software to enable proper operation of the article. This includes determining where to integrate an item (*e.g.,* integration of a civil engine into a destroyer which requires changes or modifications to the destroyer in order for the civil engine to operate properly; not plug and play).

"Integration" is distinct from "installation," which means the act of putting something in its place and does not require changes or modifications to the item in which it is being installed (*e.g.,* installing a dashboard radio into a military vehicle where no changes or modifications to the vehicle are required).

(3) The furnishing of assistance (including training), to a foreign person regardless of whether technical data (*see* § 120.10 of this subchapter) is transferred, including formal or informal instruction in the United States or abroad by any means, in the tactical employment (not basic operation) of a defense article;

(4) Conducting direct combat operations for a foreign person (*see* paragraph (b)(5) of this section);

(5) The furnishing of assistance (including training) in the integration of a satellite or spacecraft to a launch vehicle, including both planning and onsite support, regardless of the jurisdiction of, the ownership of, or the origin of the satellite or spacecraft, or whether technical data is used; or

(6) The furnishing of assistance (including training) in the launch failure analysis of a satellite, spacecraft, or launch vehicle, regardless of the jurisdiction of, the ownership of, or the origin of the satellite, spacecraft, or launch vehicle, or whether technical data is used.

ITAR has been challenged on first amendment grounds[15], it has been argued to "hamstring both the national space policy and the commercial space industry"[16] and it its potential to impair the ability to obtain informed consent from participants in commercial space flight[17]. It has created problems for firms in close allies, such as Australia, who must balance non-proliferation commitments entered into to allow access to U.S. goods with local law restricting discrimination.[18] It has been asserted that U.S. export controls even impair the autonomy of the Canadian government to "collaborate on international space missions", which is particularly problematic in the case of multi-craft missions.[19] Scientists have raised concerns about its impact on the discrimination, confirmation and rigor of research, due to the prospective (and actualized, in some cases) requirement to redact certain experimental details.[20] Academics and researchers fear being jailed over their work and are avoiding projects and/or restricting access to foreign nationals out of this fear.[21] ITAR has even impacted the ability to conduct arbitration proceedings for the satellite industry.[22] The removal of the Canadian exemption under ITAR in 1999 provides a profound statement of the impact of the regulations: a 21% decline (from71% to 50% of respondents) in Canadian firms working with U.S. partners.[23] Moreover, the amount of involvement of the firms with U.S. partners also decreased.

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[15] Ryan Alan Murr, *Privacy and Encryption in Cyberspace: First Amendment Challenges to ITAR, EAR and their Successors*, 34 SAN DIEGO L. REV. 1401-1462 (1997).

[16] P.J. Blount, *The ITAR Treaty and Its Implications for U.S. Space Exploration Policy and the Commercial Space Industry*, 73 J. AIR L. & COMM. 705-722 (2008).

[17] P.J. Blount, *Informed Consent v. ITAR: Regulatory Conflicts that Could Constrain Commercial Human Space Flight*, 66 ACTA ASTRONAUTICA 1608-1612 (2010).

[18] Simon Rice, *Staring Down the ITAR: Reconciling Discrimination Exemptions and Human Rights Law*, 10(2) CAMBERRA L. REV. 97-113 (2011).

[19] Michael C. Mineiro, *US Export Controls and Canadian Autonomy to Collaborate on International Space Missions*, 26 SPACE POL'Y. 99-104 (2010).

[20] Arturo Casadevall, et al., *Redaction of Sensitive Data in the Publication of Dual Use Research of Concern*, 5(1) MBIO 1-2 (2014).

[21] Sharon Weinberger, *Export-Control Laws Worry Academics*, 461 NATURE 156 (2009).

[22] Raymond G. Bender, *Conducting Satellite Industry Arbitrations Under the Watchful Eye of the International Traffic in Arms Regulations*, AAA HANDBOOK ON INTERNATIONAL ARBITRATION & ADR (2006).

[23] Eric Choi & Sorin Niculescu, *The Impact of US Export Controls on the Canadian Space Industr*y, 22 SPACE POLICY 29-34 (2006).

i. ITAR is restrictive in application and broad in scope of definition

The key points to this are that a US person as defined by §120.15, citizens, nationals, permanent residents, refugees admitted under 8 U.S.C. §1157, asylum grantees under 8 U.S.C. §1158 and individuals who qualify under 8 U.S.C. §1160(a) or 1255a(a)(1) (which are special cases related to certain individuals entering in the 1980s), cannot take any action deemed to be an export under §120.17. It is critical to note that section §120.17 does not establish the concept of a deemed export (where an export occurs without the item leaving the United States – the term deemed export is explicitly used in 15 C.F.R. §734.2(b)(2)(ii) of the EAR) for physical hardware, with the exception of a transfer directly to a foreign government (not just a foreign citizen). It however does preclude removal of a controlled item, a transfer of "registration, control or ownership"[24] of some items, disclosing technical data or performing a defense service.

It is important to note that technical data explicitly doesn't include data in the public domain as defined in §120.11, which defines it as "information which is published and which is generally accessible or available to the public". A number of ways that information would be deemed to be available are enumerated, including information disseminated via bookstores and newsstands, unrestricted subscription publications, items mailed second class, at libraries, in patents and at tradeshows, conferences and other meetings in the United States. It also includes items approved for "public release (*i.e.,* unlimited distribution) in any form" by federal agencies. Finally, a category for higher education institutions is included which includes materials created[25]:

> (8) Through fundamental research in science and engineering at accredited institutions of higher learning in the U.S. where the resulting information is ordinarily published and shared broadly in the scientific community. *Fundamental research* is defined to mean basic and applied research in science and engineering where the resulting information is ordinarily published and shared broadly within the scientific community, as

[24] 22 C.F.R. §120.17(a)(2).
[25] 22 C.F.R. §120.11.

> distinguished from research the results of which are restricted for proprietary reasons or specific U.S. Government access and dissemination controls. University research will not be considered fundamental research if:
>
> (i) The University or its researchers accept other restrictions on publication of scientific and technical information resulting from the project or activity, or
>
> (ii) The research is funded by the U.S. Government and specific access and dissemination controls protecting information resulting from the research are applicable.

Robinson and McAdamis[26] suggest, however, that the definition of "fundamental research" is itself unclear, creating ambiguity as to what research efforts gain benefit from this section. This has led to conservative interpretations and significant burden for academic researchers and institutions.

ii. Most items needed for academic research are exempt from ITAR

This combination effectively covers the majority of items that would be needed in an academic research environment. Specifically, it would seem that information about the item would qualify for the public domain exemption either because it has been published (or is similarly generally available) or qualifies as basic research. Notably, there is some disagreement as to whether only research results or all research-related details qualify for the fundamental research treatment. A sense of the senate[27] indicates that this was meant to be inclusive of both. The item could be physically accessed by foreign nationals as long as they were not government agents and ownership, registration or control was not transferred to them. The two main areas of remaining concern would be performing a defense service and providing information that is excluded from the public domain exemption (e.g., if it is unpublished and has publication restrictions). Problematically, providing instruction or feedback to students and/or researchers

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[26] Robinson & McAdamis, *supra* note 7.

[27] S. 2198, 109th Cong. § 401, 2d Sess. (Jan. 26, 2006); James Ellwood Bartlett III, *Bartlet's Annotated ITAR* 21 (2013).

could be defined (and in certain cases of instruction is explicitly defined by the revised defense service definition) as providing a defense service.

iii. Small business activities are not exempt from ITAR

The case for small businesses is much less favorable, due to the lack of the fundamental research public domain treatment. Because of this, the business must control information about controlled items that has not been explicitly been published (or otherwise disseminated as described in §120.11). However, it appears that physical access to the items is not precluded as long as no export condition (removal from the United States, transfer of ownership, control or registration) occurs and the foreign national is not a government agent.

iv. ITAR does not provide an educational exemption

Providing instruction related to ITAR controlled items is equally problematic. ITAR does not provide any educational exemption. One might argue that a first amendment protection may apply as it precludes congress from making laws which abridge "the freedom of speech"; problematically, this has been generally taken to apply only to certain categories of speech. One might argue that instruction is (or should be) a class of protected speech as it is required to interpret and make informed decisions related to political matters and, because of this, deserves the same treatment as highly-protected political speech. However, the efficacy of this argument is unclear. It would seem, thus, that any instructor who provides technical data beyond "information concerning general scientific, mathematical or engineering principles commonly taught in schools, colleges and universities or information in the public domain" does so at risk of peril. Approaches which blend research and education[28] may qualify for the fundamental research treatment. This however, provides little help for instructors desiring to use unpublished (and not of a type generally pub-

[28] Ronald Fevig, James Casler, & Jeremy Straub, *Blending Research and Teaching Through Near-Earth Asteroid Resource Assessment,* THIRTEENTH SPACE RESOURCES ROUNDTABLE AND THE PLANETARY & TERRESTRIAL MINING SCIENCES SYMPOSIUM (Golden, Colorado, June 2012).

lished) details for instruction. More problematically, instructors who provide feedback on student mistakes may be performing a defense service for the student which enjoys no fundamental research or other exemption.

Recent changes[29] have significantly reduced the amount of space technology regulated by ITAR. However, this may be of little help. In §121.1, Category XV(x), it is stated:

> (x) Commodities, software, and technology subject to the EAR (*see* § 120.42 of this subchapter) used in or with defense articles controlled in this category.
>
> Note to paragraph (x): Use of this paragraph is limited to license applications for defense articles controlled in this category where the purchase documentation includes commodities, software, or technology subject to the EAR (*see* § 123.1(b) of this subchapter).

Given this, it appears that as soon as ITAR attaches to any item of the space hardware the entire assembly or project may become ITAR regulated. The note is, unfortunately, ambiguous as it could be taken to refer only to items sold together (via the term "purchase documentation"). Problematically, there are many applications that will still require an ITAR-regulated component. What could have been one of the most prevalent, GPS hardware, was excluded for most applications in the interim final rule[30], a change from the proposed rule[31] which included most orbital GPS hardware under ITAR regulation. However any spacecraft containing a prospectively ITAR controlled ITAR controlled item could bring all other project/craft items under ITAR.

Several other categories of prospective ITAR attachment exist, for those that may not be constrained by the GPS issue. These include certain antennas ("diameter greater than 25 meters", "actively scanned", "adaptive beam forming" or "for interferometric radar"), optical systems ("optical coating", "active properties", "largest lateral dimension greater than 0.35 meters"), cooling systems, vibration suppression, precise attitude determination and

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[29] 79 Fed. Reg. 27186-27187 (May 13, 2014).

[30] *Id.*

[31] 78 Fed. Reg. 31450 (May 24, 2013).

control, power amplification above certain thresholds, star trackers with certain levels of accuracy and re-entry components.[32]

B. Export Administration Regulations (EAR)

The primary authority for the EAR comes from 50 U.S.C. §1701 and 50 U.S.C. §2401 and is enacted via 15 C.F.R. §730-775. Per §736.1, "A person may undertake transactions subject to the EAR without a license or other authorization, unless the regulations affirmatively state such a requirement". Ten general prohibitions, enumerated in 736.2 provide these requirements. For the purposes of academic research and training and small business pre-sales-intent research, the first is most applicable. This prohibits, with licensure, export (or reexport) of U.S. items which have been assigned an Export Control Classification Number (ECCN) and export to the country of destination requires a license for the control reason as indicated on the Country Chart at part 738 of the EAR", unless an exemption under part 740 applies.

i. EAR is less restrictive and narrower in scope of definition

The EAR describes the concept of export in a way that specifically includes the transfer of hardware to an individual in the United States, per §734.2(b)(1) an export is either "shipment or transmission" out of the United States or a "release of technology or software subject to the EAR to a foreign national in the United States, as described in paragraph (b)(2)(ii)". Specifically, this (b)(2)(ii) includes[33]:

> Any release of technology or source code subject to the EAR to a foreign national. Such release is deemed to be an export to the home country or countries of the foreign national. This deemed export rule does not apply to persons lawfully admitted for permanent residence in the United States and does not apply to persons who are protected individuals under the Immigration and Naturalization Act (8 U.S.C. 1324b(a)(3)).

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[32] 78 Fed. Reg. 31450-31451 (May 24, 2013).
[33] 15 C.F.R. §734.2(b)(2).

The "release of technology" is deemed to occur, per §734.2(b)(3), when any one of three conditions occurs. These include "visual inspection by foreign nationals", "oral exchanges of information in the United States or abroad" and "the application to situations abroad of personal knowledge or technical experience acquired in the United States".

ii. Release of technology generally acceptable in the U.S.

Like the ITAR, the EAR also includes a number of exemptions. These include Items that are controlled by another department[34] (such as the State Department's control of items under ITAR[35]) and most published materials.

Also excluded[36] are "available technology and software, except software classified under ECCN 5D002 on the Commerce Control List" that is part of a patent application[37] or published, as defined by §734.7 to be "generally accessible to the interested public in any form" such as "periodicals, books, print, electronic, or any other media available for general distribution to any member of the public or to a community of persons interested in the subject matter, such as those in a scientific or engineering discipline, either free or at a price that does not exceed the cost of reproduction and distribution", materials at public and university libraries, items at "an open conference, meeting, seminar, trade show, or other open gathering" (where open is defined by allowing all "technically qualified" persons to attend, subject to registration fee payment and logistical considerations). Publication also includes the submission process to journals and conferences, when an "understanding that the papers will be made publicly available if favorably received" exists. Finally, "software and information" is also deemed to be published "when it is available for general distribution either for free or at a price that does not exceed the cost of reproduction and distribution".

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[34] 15 C.F.R §734.3(b)(1).
[35] 15 C.F.R. §734.3(b)(1)(i).
[36] 15 C.F.R. §734.3(b)(3).
[37] 15 C.F.R. §734.3(b)(3)(iv) & §734.10.

iii. Published or patented things and items arising from fundamental research excluded from EAR

Also excluded are items that "arise during, or result from, fundamental research, as described in § 734.8"[38]. This includes "basic and applied research in science and engineering, where the resulting information is ordinarily published and shared broadly within the scientific community" except for research related to "encryption software classified under ECCN 5D002 on the Commerce Control List (Supplement No. 1 to part 774 of the EAR), except publicly available encryption object code software classified under ECCN 5D002 when the corresponding source code meets the criteria specified in § 740.13(e) of the EAR". A specific discussion of university (an "institution of higher education located in the United States") research is provided: "research conducted by scientists, engineers, or students at a university normally will be considered fundamental research", subject to certain conditions[39]:

> (2) Prepublication review by a sponsor of university research solely to insure that the publication would not inadvertently divulge proprietary information that the sponsor has furnished to the researchers does not change the status of the research as fundamental research. However, release of information from a corporate sponsor to university researchers where the research results are subject to prepublication review, is subject to the EAR. (See Supplement No. 1 to this part, Questions D(7), D(9), and D(10).)
>
> (3) Prepublication review by a sponsor of university research solely to ensure that publication would not compromise patent rights does not change the status of fundamental research, so long as the review causes no more than a temporary delay in publication of the research results.
>
> (4) The initial transfer of information from an industry sponsor to university researchers is subject to the EAR where the parties have agreed that the sponsor may withhold from publication some or all of the information so provided. (See Supplement No. 1 to this part, Question D(2).)

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[38] 15 C.F.R. §734.3(b)(3)(ii).
[39] 15 C.F.R. §734.8.

> (5) University based research is not considered "fundamental research" if the university or its researchers accept (at the request, for example, of an industrial sponsor) other restrictions on publication of scientific and technical information resulting from the project or activity. Scientific and technical information resulting from the research will nonetheless qualify as fundamental research once all such restrictions have expired or have been removed. (See Supplement No. 1 to this part, Question D(7) and D(9).)
>
> (6) The provisions of § 734.11 of this part will apply if a university or its researchers accept specific national security controls (as defined in § 734.11 of this part) on a research project or activity sponsored by the U.S. Government. (See Supplement No. 1 to this part, Questions E(1) and E(2).)

Special consideration is also made for research at federal agencies and centers, which can designate work as "fundamental research" using "any appropriate system devised by the agency or the FFRDC to control the release of information by such scientists and engineers". Research at businesses may also qualify as fundamental if "researchers are free to make scientific and technical information resulting from the research publicly available without restriction or delay based on proprietary concerns or specific national security controls as defined in § 734.11(b) of this part"; again certain considerations exist[40]:

> (2) Prepublication review by the company solely to ensure that the publication would compromise no proprietary information provided by the company to the researchers is not considered to be a proprietary restriction under paragraph (d)(1) of this section. However, paragraph (d)(1) of this section does not authorize the release of information to university researchers where the research results are subject to prepublication review. (See Supplement No. 1 to this part, Questions D(8), D(9), and D(10).)
>
> (3) Prepublication review by the company solely to ensure that prepublication would compromise no patent rights will not be considered a proprietary restriction for this purpose, so

[40] 15 C.F.R. §734.8.

> long as the review causes no more than a temporary delay in publication of the research results.
>
> (4) However, the initial transfer of information from a business entity to researchers is not authorized under the "fundamental research" provision where the parties have agreed that the business entity may withhold from publication some or all of the information so provided.

iv. Educational exemption exists under EAR

Finally, educational information is also excluded[41]. This includes materials, as defined in §734.9, "released by instruction in catalog courses and associated teaching laboratories of academic institutions".

The EAR regime is thus demonstrably different from ITAR for several reasons. First, it explicitly deals with the transfer of hardware inside the United States. Second, it provides an exemption for items used in educational settings. Similarly, it includes an exemption for academic fundamental research; however, the disqualifying conditions are significantly relaxed. It also, unlike ITAR, extends fundamental research benefits to those outside academic institutions. Problematically, it has no mechanism to allow transfer of pre-existing hardware to research or instruction participants. It also lacks ITAR's provision[42] that allows the transfer of controlled technical information from the university to a foreign national employee, subject to some limitations. The EAR regulates most of the space related technology removed from ITAR under the recent changes[43] and, thus regulates most space technology not subject to ITAR.

III. PROPOSED CHANGES

A legislative framework is provided below that would enable bona fide academic research activities and provide a "safe harbor" for small business firms and individuals conducting research or business and attempting in good faith to comply with ITAR and EAR but that unintentionally violate a technical regulation which

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[41] 15 C.F.R. §734.3(b)(3)(iii).
[42] 22 C.F.R. §125.4(b)(10).
[43] 78 Fed. Reg. 31444-34151; 34131-341443 (May 24, 2013).

results in a non-impactful violation. The proposed changes provide a consistent framework for these entities to operate under, and give greater certainty about where the line between allowed and prohibited activities lies and reduces the legal risk of being prosecuted for an unintentional and non-impactful technical violation.

A. Academic Institutions Should Be Exempted From Licensure in Some Cases

For academic institutions, which shall include accredited U.S. colleges and universities, public and private K-12 schools which are operated by a government entity, accredited by or licensed by the state they operate in or licensed by the federal government, the following shall be exempted from requiring licensure under ITAR or EAR:

> (1) The disclosure of technical information from the academic institution to its full time employees and permanent part-time employees who are based in the United States for the duration of their employment
>
> (2) The disclosure of technical information in the course of providing instruction which is in or substantially similar to material in the public domain, interprets information in the public domain, is used to aid the understanding of information in the public domain or which is used to assess whether students have learned material that is in or substantially similar to material in the public domain.
>
> (3) The disclosure of technical information (whether or not in the public domain) by students to or performance of a defense service by students for or under the direction of a faculty member or member of the teaching or research staff (inclusive of graduate student instructors, teaching assistants, staff assistants and similar employees or contractors) at a U.S.-based academic institution.
>
> (4) The temporary access of full time employees, permanent part time employees and enrolled students to inspect, modify, integrate, disassemble or otherwise learn from or manipulate any item which is the property (including items obtained as part of a lease or government grant which does not, as part of

the grant, restrict access to such item) if any of the following conditions are met:

a. The item was the product of basic research at the academic institution

b. The item was produced as or is substantially similar to an item produced as the product of basic research at another U.S. educational institution (regardless of whether the item was obtained from a commercial vendor or the educational institution)

c. The item can be obtained or is substantially similar to an item can be obtained from a non-U.S. vendor where no EAR or ITAR attachment exists, prior to its import into the United States

d. The item was constructed by students at the academic institution as part of a course project under the direction of a member of the faculty or instructional staff

e. The item was constructed by a faculty or instructional staff member for the express purpose of its use in instruction in courses regularly offered by the institution and listed in its catalog of courses

f. The item is readily available for purchase in the U.S. for non-controlled applications, or

g. The item can be constructed based on a set of documentation that is in the public domain.

(5) The temporary access provided pursuant to (4) shall be subject to the following:

a. Items shall be secured using physical and/or electronic safeguards or supervised to prevent their removal from the designated temporary access location by non-U.S. nationals or to allow intervention to secure the item before it can be removed from the designated temporary access location.

b. The facility shall be designed or the foreign nationals supervised to prevent the collection or creation of information (inclusive of photographs, technical drawings,

schematics and test results) that could be used to allow or facilitate the creation of a restricted item whose schematics or construction instructions are not currently in the public domain.

(6) The aforementioned (1-5) shall not apply to students who are employees or agents of foreign military or espionage agencies or who are (or who, by virtue of family lineage or other status, will become) the head or an officer of a foreign state.

B. Academia, Small Businesses and Individuals Should Be Provided A Safe Harbor Provision

It is proposed for that for academic institutions (as defined in IIIA), individuals acting in a personal capacity and small businesses (as defined in 13 C.F.R. §121, excluding industry dominance considerations), the following shall apply:

For academic institutions, small businesses and individuals acting in their personal capacity who violate a provision of the EAR or ITAR (related to the aforementioned exemptions or otherwise), the government shall be required to show that it would not (based on a pattern of past behavior) have granted the required license and actual harm to national security or a pattern of repeated violations, after the party has been notified of violation, in imposing any penalty. The government shall be entitled to begin criminal or civil proceedings within a period of 90 days prior to the statute of limitations for a violation that the government, exercising reasonable judgment, believes will cause actual harm to national security at a point after the statute of limitations; however, the case shall not proceed until the government is prepared to demonstrate that actual harm has occurred.

Individuals shall be deemed to be acting in a personal capacity if they are not acting under the direction or control of another or they are acting under the direction and control of another person who is acting in his or her personal capacity. An employment relationship shall serve as absolute proof of acting under direction and control. If the individual is given specific instructions, of which the consequence of failure to follow is termination of the relationship, relating to export control activities this shall be deemed to constitute direction and control for the purposes of this section. If an entity that is not an academic institution, personal

capacity actor or small business (as described above) engages non-employee actors to engage in activities on its behalf related to export control, this entity shall be civilly and criminally liable for the acts and omissions of these actors as if these actors were its bona fide employees. This shall not apply if the individual being directed or controlled is a professional licensed to provide export control services, such as an attorney acting under his/her client's direction.

C. Rationale for Proposed Changes

Many of the proposed changes are common-sense; likely resolving problems not anticipated by the drafters of the statute. For example, the proposed section 1 expands an existing exemption for full-time employees to include part time employees (which, provides greater flexibility in line with current efforts to make laws more compatible with flexible work environments[44]). Given that the definition of full-time employees is left to the employer (subject to various other regulations which may necessitate providing health care, etc.), this would also remove the potential for this distinction to be misused (e.g., for discriminatory purposes).

Section 2 deals with a problem potentially faced by a faculty member who may believe that educational objectives can best be achieved via the use of an alternate format for presenting already commonly known information. This might be necessitated, for example, to assist a student with a disability or to increase engagement in non-disabled students. There is no real benefit to anyone from having a restriction of this type (as the information is already out there in another form). Moreover, by making the information more available (via publication, etc.) it the public domain exemption could be applied. If the goal is to minimize foreign national access to this information, clearly this is not the best course of action. Thus, this section proposes to exempt from regulation the representation of otherwise available information.

Section 3 deals with yet another potential problem: under current regulations, a student performing work for a foreign national may be performing a defense service without a licensure

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[44] *See, e.g.*, 5 U.S.C. 6120 *et. seq.* (Federal Employees Flexible and Compressed Work Schedules Act).

(one could argue that they are performing the work for the university and not the foreign-national PI, eliminating this issue; however, this seems ambiguous and might simply transfer the point-of-problem). While the university can give its employee ITAR and EAR restricted information, a student not acting in an institutional capacity (e.g., not an employee) enjoys no similar protection. Practically, this regulation removes a somewhat absurd presumption of knowledge transfer in an illogical direction (from trainee to trainer). If nothing else, it eliminates the "sorry professor, I can't turn in my homework because its waiting for the approval of the export control officer" issue and the associated compliance required.

The proposed Section 4 helps achieve wider practice of research. It is important as it allows institutions to buy hardware to jump-start research without losing the benefit of the fundamental research exemption. For example, if a prestigious research institution (for example) has already developed an item as a fundamental research product they can use it without restriction; however, it another university wants to engage in similar work, they must re-build this proverbial wheel or buy an item (which brings potential access control restrictions, licensing issues and TAA management issues). This offers significant value in that it allows work to leapfrog (instead of requiring development from the ground-up). It is also well suited to maintaining a diverse and distributed national research base, instead of research being concentrated at a few specific centers.

Finally, a requirement to show harm is proposed for small businesses and individuals. While large entities can afford the compliance staff to avoid all violations, smaller businesses (including those that may be legitimately trying to comply with a given section of the regulations or whose understanding of the regulations is incomplete or misinformed) and individuals simply cannot afford this expense. By requiring harm to be demonstrated, the government can still prosecute offenders who have impaired national security while a limited safe harbor is created from technical but non-impactful violations. This notion is well aligned with the doctrine of restricting free speech (e.g., the balancing of gov-

ernment needs against personal freedoms[45]). If there is no harm, then it would seem that there was no need for the restriction. This is, of course, problematic, as it may remove the fear of doing things that could cause harm. This, however, could be easily handled by reiterating (via all of the existing points-of-information) the severity of the punishments if harm is caused and by noting that the combination of breaking the statute and harm occurring is all that is required (e.g., there is no defense of not believing harm would occur / harm didn't occur in the past / etc.).

D. Impact of Proposed Changes

The proposed changes are designed to have a minimal impact on national security. While they may marginally reduce the difficulty of gaining access to certain information (e.g., by allowing an individual to be only a part-time employee instead of a full-time employee or via allowing a professor to present information in a more understandable way), they don't make information that is unavailable to an individual determined to access it available for access. While any change of this sort must weigh the positive benefits (reducing confusion and fear and incentivizing innovation and entrepreneurship) versus whatever security impact they may have; those proposed herein generally deal with violations not typically pursued by regulators[46]. Moreover, the proposed changes serve to benefit (almost exclusively) those who are studiously following the law. An individual with even limited intent would find only the most minute benefit towards achieving their ends from the proposed (and this comes, primarily, from reducing the stress and concern of those individuals trying to obey the law, perhaps making them less reluctant to provide ITAR or EAR restricted materials).

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[45] In *Bernstein v. United States*, 922 F. Supp. 1426 (1996), the district court found that the plaintiff's software was speech protected by the first amendment and its restriction (via the AECA and ITAR) could be subjected to judicial review on this constitutional basis, despite language in the regulations prohibiting judicial review of certain agency determinations. Alternatively, in *Universal City Studios v. Reimerdes*, 111 F.Supp.2d 294 (2000), the right to freedom of speech was found to be overridden by the plaintiff's need for protection from this speech (namely the plaintiff's computer code that would enable duplication of DVDs).

[46] *See, e.g.*, *Bartlett's Annotated ITAR*, *supra* note 27.

IV. EXAMPLE ILLUSTRATION

A hypothetical example illustrates the problems with the current regulations and the benefits of the proposed changes. In this example, a small business (meeting applicable safe harbor definitions) building enhanced spacecraft GPS systems is spun-off from a major research university. The foundational work for this business has been performed by a U.S. national professor, a foreign national graduate student and a full-time foreign national faculty research assistant. The U.S. national professor continues in her post, while the foreign national graduate student completes his degree and is hired (under a practical training visa) by the new entity. The foreign national research assistant resigns from the university employment and is also hired by the new entity. The university, which is a limited shareholder in the company along with the professor, licenses the intellectual property developed by the three to the company. In addition to the business, the professor continues advanced work on this topic under the auspices of the university.

As part of the agreement between the company and the university, copies of the research materials (including both published and unpublished internal documents) are provided to the new entity. This material consists largely of work performed by the former graduate student and research assistant. These materials are provided, by the professor/owner, to the two employees upon their arrival.

The ongoing work at the university discovers a more advanced method of GPS position determination which utilizes additional data to provide a more accurate position fix. As this material is covered by the licensing agreement between the university and the new entity, the professor brings unpublished materials created by a foreign national research assistant to the two employees of the company. They create an enhanced product which attracts the attention of the Air Force as an enhancement to the U.S. national defense.

While the foregoing seems to provide only benefit to U.S. national security, the professor, the entity and the university could all be facing criminal penalties under both ITAR and EAR. Despite having developed the majority of the materials created, the professor/owner committed a 'deemed export' of technical infor-

mation when providing these materials to the new employees. She faces stiff penalties, despite the fact that she was providing them with information that was largely created by them as was (at least at one point) already known to them). An additional violation occurred when the new details about the advanced position accuracy were provided. While the full time research assistant could have been provided these details under an exemption for full time employees of the university, this no longer applied once this individual moved to become an employee of the entity. The graduate student assistant never enjoyed this exemption. Because of the role ambiguity (was the professor/owner acting as an agent of the business having received the material from the university or still acting as an agent of the university when she provided the materials to the two?), it is possible that both the business and the university could face ITAR sanctions for the second dissemination of information. Given the fact that the professor was more likely acting as an agent of the business (this is, however, far from certain), only the business would likely face sanctions for the first dissemination of information (though the state could argue that the professor/owner was acting in a dual-agent role, or still as the university's agent, potentially subjecting the university to sanctions for this violation as well). Despite there being no harm (and actually benefit that would not have accrued without the foreign national participation) to national security, both the university and business could be facing heavy fines and the professor an extended prison sentence. While the history of enforcement by the DDTC does not suggest that this type of enforcement action would be very likely, changes in enforcement priorities or agency operations could result in this occurring. Under the proposed model, both the university's and the business's disclosures would fall under a safe harbor provision requiring the government to demonstrate bona fide harm to national security to be successful in prosecution of these technical violations. As no harm (and actually benefit) occurred in this theoretical, there could be no conviction for these offences.

V. CONCLUSION: CONSIDERATION OF POLITICAL FEASIBILITY OF CHANGES

Several prospective approaches to effect the changes proposed herein exist, each with differing levels of political complexity and, correspondingly different probability of prospective implementation. These include action by congress, re-interpretation of the United States Code into alternate Code of Federal Regulations language, action by modification of the munitions list and EAR ECCN classifications and executive order.

The simplest approach, from an explanation standpoint (which is, ironically, perhaps the most difficult to effect in the current political climate) would be for congress to act to change the U.S. Code to reflect the proposed safe harbor. While the changes proposed would likely not be partisan, it is likely that this change would occur in the context of a larger (likely partisan) process, resulting in potential gridlock. The relation to national security could also make the changes, if presented on their own, a target for political attack, if this was deemed to be politically expedient.

Several prospective ways to reinterpret 22 U.S.C. §2778 et seq. appear possible that would effectively create the proposed safe harbor. Perhaps the simplest would be to modify the punishments available for violation, making acts that fall under the safe harbor have no punishment (or a very nominal punishment). In 22 U.S.C. §2778(c), an offender can be "fined for each violation not more than $1,000,000 or imprisoned not more than 20 years, or both". In 22 U.S.C. §2778(e), civil penalties can be assessed, limited in that "for each violation involving controls imposed on the export of defense articles and defense services under this section may not exceed $500,000". Given that neither specifies that a prosecution must occur or that a minimum penalty must be assessed, agency action to refine implementation in the C.F.R. would appear possible. Some provisions of the proposed safe harbor can likely be, similarly, incorporated in other areas of the C.F.R. without necessitating changes to the U.S.C., making areas covered thereby non-prosecutable (in addition to having no or a trivial penalty).

The munitions list could be changed to exclude on a per-area/item basis transactions that involve parties that were proposed for safe harbor status herein (subject to the limitations on

this safe harbor status). The agency has considerable discretion in the creation of this list and could effectively create safe harbor status by simply excluding items. For example, in 79 FR 92, a note ("The articles described in this paragraph are subject to the EAR when, prior to export, reexport, retransfer, or temporary import, they are integrated into and included as an integral part of an item subject to the EAR") makes integration into another item an exclusion condition from regulation. This could similarly be done to exclude items from regulation for parties proposed herein to enjoy safe harbor benefits, subject to the limitations of that safe harbor.

The executive order creating the Deferred Action for Childhood Arrivals (DACA) program[47] suggests that executive order may be another way to create the proposed safe harbor. Described as a "a use of prosecutorial discretion" whereby the administration instructs the agency to act in particular way towards offenders of a particular law, it would seem that there is little that could not be done to limit enforcement with this type of approach. There is, as would be expected, significant debate as to the constitutionality of this approach.[48] While this might not have seemed a viable way of creating a safe harbor previously, the use of executive action for the DACA program serves as a prospective precedent for this type of executive order in the future.

This paper has proposed several minor changes to the EAR and ITAR which serve to create a limited safe harbor for education, small businesses and individuals acting in a personal capacity. This serves to reduce concerns about compliance that may inhibit the very technical advancements that are critical to U.S. national security interests. While the proposed eases the fear of enforcement for those in these groups, it – critically – does not prevent regulators from pursuing important violations which lead to bona fide security impacts. Instead, it proposes that a distinction be made between these impactful violations (which must be prevented via fear of punishment) and inadvertent, technical and

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[47] Department of Homeland Security, *Consideration of Deferred Action for Childhood Arrivals (DACA)*, http://www.uscis.gov/humanitarian/consideration-deferred-action-childhood-arrivals-daca (last visited Dec. 30, 2014).

[48] Perry Chiaramonte, *Obama's refusal to deport illegal aliens unconstitutional, say law professors,* FOXNEWS.COM (Oct. 13, 2012), http://www.foxnews.com/us/2012/10/13/obama-refusal-to-deport-illegal-aliens-unconstitutional-say-law-professors/.

non-impactful violations which are all but inevitable as individuals, educators and small businesses attempt to navigate a complex series of intertwined regulations.

MILITARY USES OF OUTER SPACE: LEGAL LIMITATIONS, CONTEMPORARY PERSPECTIVES

Isavella Maria Vasilogeorgi[*]

ABSTRACT

After the end of the Cold War, a dramatic swift has been observed in the space activities of States. Whereas in the beginning the various space programmes where more peace-oriented, the increased commercialization of outer space led to the need to increase defensive technology in space as well.

The problems arising out of the intensified militarization of outer space over the last decades form part of the analysis of the present Article. The interrelation of general international law and of space law is at the background of all relevant argumentation presented in this paper.

The modern trends in State practice are also presented and analysed, within the context of the current legal regime. Suggestions and comments on the different proposals presented for solving the problems, real or fictional, of space law, have been included in the Article.

The conclusion drawn from the research performed for the writing of this paper indicates that the current legal regime governing space law is sufficient for the regulation of almost all issues created by modern technology. The only necessary change is that

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This article is an edited version of the author's Master's Thesis for the Post-graduate degree in Air & Space Law at McGill IASL. The author would like to express her sincere acknowledgements to her supervisor, Prof. Ram S. Jakhu,; Prof. Paul B. Larsen, who reviewed this paper as an external examiner; and the Board of the Erin J.C. Arsenault Fellowship in Space Governance, without the financial support of which, studying at McGill would have been impossible. As always, a warm thank you goes to Prof. Maria Gavouneli for always being there. Last but not least, the insight and comments of Mr. Steve Mirmina and Mr. Michael Dodge are greatly appreciated. The opinions and views expressed in this Article are those of the author alone.

of a change of attitude and conviction of the States towards the law, and perhaps a few minor adjustments to address completely novel concepts.

PROLOGUE

It is true that, after the end of the Cold War era, we have become witnesses of a shift in focus to spatial activities. From missions dedicated to create awe to the spatial counterpart and the designing of defensive – or even passive aggressive – military systems, we have moved to more science-driven and peaceful projects concerning space exploration, Earth monitoring, telecommunications etc. However, even if the old trend is subdued, outer space is still a field where military uses and applications can be realized. Recent developments have indeed demonstrated a swift of the pendulum towards a more military-central approach to space related activities, especially with the emergence of new space-faring Nations.

Entitled "*Military uses of outer space: legal limitations, contemporary perspectives*," the present Article will attempt to draw a precise picture of the current legal *status quo* and the latest challenges thereto. The stepping stone for this analysis will be the "peaceful use" and "peaceful purposes" clauses found in Articles III and IV of the Outer Space Treaty,[1] the cornerstone of space law. The notion of "peaceful" use or purpose regarding spatial activities has admittedly been the subject of great debate among scholars, since it gives a rather wide margin of interpretation as to what constitutes a conduct compatible with the OST provisions. Notwithstanding the *expressis verbis* prohibition of placing nuclear weapons[2] or weapons of mass destruction[3] in orbit or on the Moon and other celestial bodies, found both in the OST and the

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[1] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 [hereinafter OST].

[2] Louis Haeck, *Les armes nucléaires dans l'espace et la contribution canadienne à la defense nucléaire*, 14 ANNALS AIR & SPACE L. 237, 237-254 (1989).

[3] R. Mueller, *The Prevention of an Arms Race in Outer Space – The Present International Law and Aspects of its Necessary Improvement*, *in* PROCEEDINGS 29TH COLLOQUIUM 62-66, at 64 (Innsburg 1986).

Moon Agreement,[4] as well as a series of General Assembly resolutions,[5] one could argue that any other military use of outer space is in fact permissible. It is this trail of thought that gave birth to notions such as "militarisation" or "demilitarisation" of outer space, resulting in flammable academic debate over what was considered terminology insufficiently defined.[6] The understanding that "aggressive and military activities in outer space present one of the greatest risks of mankind"[7] was swiftly reached.

The ever-growing technological advancements, as supported with State practice and corresponding State will, have also resulted in new challenges to the peaceful use of outer space.[8] The creation of long-range ballistic missiles, anti-satellite defensive systems and the so-called "smart weapons," most often operated *via* satellite networks, are but a few examples projecting the need to re-examine the compatibility of such activities with the aforementioned OST and Moon Agreement provisions.

Another crucial domain of focus, as far as military uses of outer space are concerned, will be the interrelation of space law with general international law and the UN Charter[9] in this respect. The end of the Cold War did not only mark a new age for space activities, it also unblocked the Security Council from the *veto* policy of the two super-powers. Being faced with modern challenges and threats to international peace and security, the Security Council has actively granted authorisation for the use of force under Chapter VII of the UN Charter over the last two decades. How would the idea of using spatial military systems towards maintaining international peace and security correlate with the

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[4] *Agreement* Governing the Activities of States on the *Moon* and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 21 [hereinafter Moon Agreement].

[5] G.A. Res. 1472 (XIV), U.N. Doc. A/RES/1472 (XIV) (Dec. 12, 1959); G.A. Res. 1721 (XVI), U.N. Doc. A/RES/1721 (XVI) (Dec. 20, 1961); G.A. Res. 1802 (XVII), U.N. Doc. A/RES/1802 (XVII) (Dec. 14, 1962); G.A. Res. 54/67, U.N. Doc. A/RES/54/67 (Dec. 6, 1999).

[6] Ram Jakhu & Maria Buzdugan, *"Peaceful" and Military Uses of Outer Space – Law and Policy*, 30-II ANNALS AIR & SPACE L. 511, 512 (2005).

[7] Karl-Heinz Böckstiegel, *Prospects of Future Development in the Law of Outer Space*, 8 ANNALS AIR & SPACE L. 305, 312 (1983).

[8] Steven A. Mirmina, *The Ballistic Missile Defense System and its Effects on the Outer Space Environment*, 31-II J. SPACE L. 287, 311 (2005).

[9] 1945 UN Charter, 15 *UNCIO* 335.

demands of space law? The following analysis will attempt to examine the circumstances under which such a practice would be vested with legitimacy.

Last but not least, the issue of verification of spatial activities is of the utmost importance for such a case-study. Only a few, if in fact any at all, satellites are registered today as military satellites, even though their existence is nothing short of a common secret.[10] Nevertheless, the demand for peaceful uses of outer space seems to indicate the necessity of actual verification of the space objects launched and their capabilities. The extent of compatibility of this demand with a State's right to self-defence and the prohibition of interference to the internal affairs of a State will also form a part of the present Article.

The Article is constructed in two parts. The first part analyses the legal limitations set in the use of force and other military uses in outer space deriving from general public international law, customary and conventional alike. In particular, the *ius ad bellum* and the *ius in bello* regimes will be examined under the prism of military activities conducted in or related to outer space. Beginning by providing a general overview about the prohibition of threat or use of force in general international law, the inherent right to self-defence and its exercise in outer space form the second chapter of this part, while the third focuses on the issue of authorisation for the use of force by the Security Council under Chapter VII of the UN Charter. The forth chapter focuses on the compatibility of space technologies in the case of peace-keeping operations. Chapter five finally addresses issues of responsibility and/or liability relating to the use of force in or through outer space.

Part two of the Article consists of the analysis of the contemporary perspectives regarding the militarisation of outer space. Chapters one and two examine the recent paradigms of use of anti-satellite weapons and the issue of ballistic missiles and other space weapons, in the hope of detecting the conformity of State practice with the current rules or the seeds of new trends in the understanding of these rules. Chapters three and four analyse the emerging proposals for complete deweaponisation and demilitari-

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[10] Alexander Proelß, *Peaceful Purposes*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §6, www.mpepil.com (last visited Nov. 10, 2014).

sation of outer space, as articulated in the Draft Treaty on Prevention of Placement of Weapons in Outer Space (PPWT) proposed by Russia and China and the 2010 European Code of Conduct, both under the context of PAROS. Finally, chapter five addresses the issue of verification of space objects, directly linked to the efforts on confidence-building associated with the deweaponisation endeavour.

The concluding remarks found in the Epilogue put together the outcomes reached from authoring the afore-described two parts. It is evident that we are now at a turning point as far as spatial activities are concerned, and it would not be a hyperbole to say that we are observing a reshaping and a re-evolution of the global space community.[11] The increasing number of commercial uses of outer space and the discussion on the exploitation of natural resources of different celestial bodies are mere indications to this assessment. It is I think important to examine, if the evolution of State practice, as far as space activities are concerned, will consequently provoke an analogous shift of the overall spirit and character of the law of Outer Space.

Before continuing with the substantive analysis of the aforementioned issues, it is crucial to clarify some terms, based on the opinions of leading scholars in the field of international space law, the first naturally being "peaceful uses."

While at the beginning of the space era both super powers, the USA and the USSR accepted that "peaceful" meant non-military, this view was quickly abandoned by the change in policy of the USA and the significant number of military payloads launched by the USSR.[12] It became apparent short after the signing of the OST that military satellites were indeed being developed and used by both super-powers.[13] Gradually, the predomi-

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[11] Jackson N. Maogoto & Steven Freeland, *From Star Wars to Space Wars – The Next Strategic Frontier: Paradigms to Anchor Space Security*, 33 AIR & SPACE L. 10 (2008).

[12] Ivan Vlasic, *The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space*, *in* B. JASANI (ED.), PEACEFUL AND NON-PEACEFUL USES OF SPACE: PROBLEMS OF DEFINITION FOR THE PREVENTION OF AN ARMS RACE (Taylor & Francis, New York, 1991); Ivan Vlasic, *Space Law and the Military Applications of Space Technology*, *in* NANDASIRI JASENTULYIANNA (ED.), PERSPECTIVES ON INTERNATIONAL LAW 385-410 (Kluwer Law International, Boston 1995).

[13] Mircea Mateesco-Matte, *Des agents très spatiaux: quel régime juridique? Au vingtième anniversaire de l'ère spatiale*, 2 ANNALS AIR & SPACE L. 351, 353 (1977).

nant opinion converged towards the view that "peaceful" meant "non-aggressive,"[14] since the UN Charter prohibits the threat or use of force in international interstate relations.[15] This rather restrictive interpretation has not been welcomed by everyone, with scholars such as Manfred Lachs vehemently protesting against it.[16] Lachs in fact envisioned a world where armaments would be prohibited gradually from various environments, as it was indeed happening with the Antarctic Treaty[17] and the Limited Test Ban Treaty,[18] so that one day States would only be confined to peaceable activities.[19] Proposals for amendment of the pertinent provisions of the space treaties have been made, but unfortunately no such procedure ever commenced.[20] Nevertheless, State practice seems to have prevailed over the intention of the drafters of the treaties,[21] and even perhaps over the very wording of the law,

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[14] Martin Menter, *Peaceful Uses of Outer Space and National Security*, *in* PROCEEDINGS 25TH COLLOQUIUM 135-143, at 137 (Paris 1983); CARL. Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 5 (Pergamon Press, New York 1982); Marko G. Markoff, *Disarmament and "Peaceful Purposes" Provisions in the 1967 Outer Space Treaty*, 4 J. SPACE L. 3, 6 (1976); Daniel Goedhuis, *Some Observations on the Efforts to Prevent a Military Escalation in Outer Space*, 10 J. SPACE L. 13, 16 (1982); Ram Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32-I J. SPACE L. 31, 85 (2006).

[15] U.N. Charter art. 2, para. 4.

[16] MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW MAKING (REISSUED ON THE OCCASION OF THE 50TH ANNIVERSARY OF THE INTERNATIONAL INSTITUTE OF SPACE LAW) (Martinus Nihhoff, Leiden & Boston, 2010) 98; J. F. McMahon, *Legal Aspects of Outer Space, Recent Developments*, 41 BRIT. Y.B. INT'L L. 417, 419-422 (1965-1966); Nikolaos. Poulantzas, *The Outer Space Treaty of January 27, 1967. A Decisive Step Towards Arm Control, Demilitarization of Outer Space and International Supervision*, 20 REVUE HELLÉNIQUE DE DROIT INTERNATIONAL 66, 66 (1967); GYULA GAL, SPACE LAW (Budapest 1969), 164-175; P. C. JESSUP & H. J. TAUBENFELD, CONTROLS OF OUTER SPACE AND THE ANTARCTIC ANALOGY (Columbia University Press, New York 1959) 223.

[17] Antarctic Treaty, *opened for signature* Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 72.

[18] Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water, *opened for signature* Aug. 5, 1963, 14 U.S.T. 1313, T.I.A.S. 5433, 480 U.N.T.S. 43.

[19] LACHS, *supra* note 16, at 100.

[20] Eilene Galloway, *Governing in Action: The Role of Political Science in Outer Space Activities*, 13 ACTA ASTRONAUTICA 467 (1986).

[21] Peter Jankowitsch, *The Role of the United Nations in Outer Space Law Development: Past Achievements and New Challenges*, 26-II J. SPACE L. 101, 103 (1998).

perhaps due to the "intimate intertwining"[22] of military and commercial applications.

Another set of terms that needs to be clarified is "militarisation" and "weaponisation," which are sometimes used interchangeably by authors. This use however is not completely accurate, as militarisation signifies the use of outer space for military purposes, but not necessarily through exclusively military means (such as military satellite telecommunications realized by the use of civilian, commercial satellites), while weaponisation means the stationing in outer space of a space weapon or system, with the possibility of immediate or nearly immediate use thereof.[23] Said weaponisation is believed to happen as States will develop either defensive systems for their space assets or offensive systems against enemy States wanting to use similar assets.[24] However, there are also voices claiming that such a prospect would be extremely dangerous, and would in fact hinder the future commercial use of outer space by as many States as possible,[25] especially by the developing countries.[26]

PART I: LEGAL LIMITATIONS: THE USE OF FORCE AND OUTER SPACE

The Prologue of this Article focused on clarifying the notion of "peaceful" use or purpose regarding spatial activities, which has admittedly been the subject of great debate among scholars, since it gives a rather wide margin of interpretation as to what constitutes a conduct compatible with the OST provisions. The birth of concepts such as "militarisation" and "demilitarisation" of outer

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[22] Christopher M. Petras, *The Use of Force in Response to Cyber Attack on Commercial Space Systems – "Re-examining "Self-defense" in Outer Space in Light of the Convergence of US Military and Commercial Space Activities*, 67 J. AIR L. & COM. 1213, 1219 (2002).

[23] Michael C. Mineiro, *The United States and the Legality of Outer Space Weaponisation: A Proposal for Greater Transparency and a Dispute Resolution Mechanism*, 33 ANNALS AIR & SPACE L. 441, 449 (2008).

[24] Elizabeth Waldrop, *Weaponization of Outer Space: US National Policy*, 29 ANNALS AIR & SPACE L. 329, 331 (2004).

[25] Todd Barnet, *Legal Fictions in the Five United Nations Space Treaties Stifle Commerce and Encourage a Dangerous and Chaotic Space Environment*, 28 ANNALS AIR & SPACE L. 257, 272 (2003).

[26] *See* Nandasiri Jasentuliyana, *Civilian and Military Space Activities: A Third World Perspective*, 12 ANNALS AIR & SPACE L. 247 (1987).

space was a direct result of said debate and, as explained above, has tested the limitations imposed by space law on the various activities of States in and in relation to outer space.

However, any analysis would remain incomplete, if general international law were not to be taken into consideration, in accordance with article 3 OST. In this first part of the Article, the correlation between space law and general international law *as per* the use of force will be examined, in an attempt to solidify the framework of legal limitations on the spatial military activities of States.

A. The prohibition of threat or use of force in general international law.

Constituting the basis for discussion on the issue of the use of force, article 2§4 UN Charter[27] has been described by scholars as the "cornerstone of peace in the Charter,"[28] "the heart of the United Nations Charter"[29] and "the basic rule of contemporary public international law,"[30] while the prohibition rule stipulated therein has acquired the status of *ius cogens*.[31] According to the predominant theory,[32] the notion of force refers only to armed force against another State. Under that specific scope, one can include all activities relevant to military action, from the transfer of soldiers to the borders to the act of warfare itself. This was also confirmed by the

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[27] U.N. Charter art. 2, para. 4.

[28] Claud H. M. Waldoc, *The Regulation of the Use of Force by Individual States in International Law*, 81 R.C.A.D.I. 451, 492 (1952).

[29] Louis Henkin, *The Reports of the Death of Article 2(4) are Greatly Exaggerated*, 65 AM. J. INT'L L. 544, 544 (1971).

[30] EDUARDO JIMÉNEZ DE ARÉCHAGA, EL DERECHO INTERNACIONAL CONTEMPORANEO (Madrid 1980).

[31] Juan A. C. Salcedo, *Reflections on the Existence of a Hierarchy of Norms in International Law*, 8 EUR. J. INT'L L. 583, 588 (1997).

[32] DEREK W. BOWETT, SELF-DEFENCE IN INTERNATIONAL LAW 148 (Manchester, 1958); IAN BROWNLIE, INTERNATIONAL LAW AND THE USE OF FORCE BY STATES 362 (Oxford, 1963); SUBHAS KHARE, USE OF FORCE UNDER THE UN CHARTER 27-28 (Metropolitain, New Delhi, 1985); JAI N. SINGH, USE OF FORCE UNDER INTERNATIONAL LAW 212 (Harnam, New Delhi, 1984); Georg Dahm, *Das Verbot der Gewaltanwendung nach Art.2(4) der UNO-Charta und die Selbsthilfe gegenüber Völkerrechtsverletzungen, die keinen bewaffneten Angriff enthalten*, 11 JAHRBUCH FÜR INTERNATIONALES RECHT 48-72, 49 (1962); Dietrich Schindler, *Die Grenzen des völkerrechtlichen Gewaltverbots*, 26 BERICHTE DER DEUTSCHEN GESELLSCHAFT FÜR VÖLKERRECHT 11-47, 14 (1986); YOREM DINSTEIN, WAR, AGGRESSION AND SELF-DEFENCE 86 (Cambridge, 4th ed., 2005).

Declaration on Principles of International Law, Friendly Relations and Co-operation among States,[33] now considered to be reflecting customary international law,[34] where forms of force other than military, such as economic or political, fall under the scope of the non-intervention principle.[35] The prohibition is addressed to and protects States (even non-members of the UN), exclusively as far as their international relations with other States are concerned.[36] The ICJ has held that the prohibition of threat or use of force was in fact the "cardinal rule"[37] of public international law, not only on a conventional, but also on a customary level.[38] The rule has hence a dual nature, its distinct sides living and evolving in parallel.[39]

Indeed, from the very beginning of the past century, there were several efforts undertaken by States in order to restrict the freedom to resort to war. The first of them aimed at creating a specific procedure or timeframe for the beginning of hostilities.[40] The first international convention to prohibit the recourse to war was the General Treaty for Renunciation of War as an Instrument of National Policy, known as the Briand-Kellogg Pact,[41] to which 57 States became Parties, although other similar efforts have failed in the past.[42] Despite its shortcomings, namely concerning the sanctions, the Pact constituted the basis for the creation of the customary prohibition of use of force[43] and was the inspiration for the wording of article 2§4 UN Charter.

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[33] G.A. Res. 2625 (XXV), U.N. Doc. A/RES/25/2625 (Oct. 20, 1970).

[34] Case Concerning Military and Paramilitary Activities in and against Nicaragua, ICJ Reports 1986, §§191-193 [hereinafter *Nicaragua* case].

[35] Albrecht Randelzhofer, *Article 2*, *in* BRUNO SIMMA (ED.), THE CHARTER OF THE UNITED NATIONS, A COMMENTARY 111-136, 118 (2nd ed., Oxford, 2002).

[36] *Advisory Opinion on the Accordance with International Law of the Unilateral Declaration of Independence in Respect of Kosovo*, ICJ Reports 2010, §80.

[37] *Nicaragua* case, *supra* note 34, §190.

[38] *Id.* §§174, 178.

[39] *Id.* §179 ; Caroline Lang, *L'affaire Nicaragua / États-Unis devant la Cour International de Justice*, LGDL 123 (1990).

[40] Hague Convention III relating to the Opening of Hostilities, art. 1 (1907), *available at* www.yale.edu/lawweb/avalon; Covenant of the League of Nations, arts. 10, 12, 13 & 15 (1919), 225 CTS 195.

[41] General Treaty for Renunciation of War as an Instrument of National Policy, art. 1 (1928), 94 LNTS 57 [hereinafter Briand-Kellogg Pact].

[42] Geneva Protocol for the Pacific Settlement of International Disputes, art. 2 (1924).

[43] Franciszek Przetacznik, *The Unlawfulness of War under Contemporary International Law*, 67 REVUE DE DROIT INT'L 183, 190 (1989).

Any use of force, whether direct or indirect, violates article 2§4 UN Charter, if it constitutes unilateral action to forcibly deprive a State of its legal rights,[44] the respect of which being the "first and foremost [obligation] imposed by international law upon a State"[45] as "an essential foundation of international relations."[46] Additionally, any use of force violates article 2§4 UN Charter if it does not fall under the accepted exceptions to the prohibition norm.[47]

It is clear that the prohibition of threat or use of force is not absolute,[48] since the Charter includes, in an exhaustive manner, certain circumstances under which a State can lawfully resort to force in its international relations with third States. These conditions can be found in articles 39 to 51 UN Charter and form following parts of this analysis.

An institution that definitely falls outside the scope of accepted exceptions to the rule of article 2§4 is that of forcible countermeasures. Countermeasures were formerly known as reprisals,[49] the term was however gradually abandoned when it became synonymous to forcible actions of a State in response to wrongful acts of another during the course of an international armed conflict. By endorsing the term countermeasures, international law literature now covers all kinds of "measures that would otherwise be contrary to the international obligations of an injured State vis-à-vis the responsible State, if they were not taken by the former in response to an internationally wrongful act by the latter in order to procure cessation and reparation."[50]

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[44] Nicholas Rostow, *Nicaragua and the Law of Self-defense Revisited*, 11 YALE J. INT'L L. 437, 453 (1986).

[45] The Case of the S.S. "Lotus", France *v.* Turkey, PCIJ Series A no. 10, 1927, p. 18.

[46] Case concerning the Corfu Channel, United Kingdom of Great Britain and Northern Ireland v. Albania, ICJ Reports 1949, p. 35.

[47] Oscar Schachter, The Nature and Process of Legal Development in the International Society, *in* RONALD ST. J. MACDONALD AND DOUGLAS. M. JOHNSTON, STRUCTURE AND PROCESS OF INTERNATIONAL LAW – ESSAYS IN LEGAL PHILOSOPHY, DOCTRINE AND THEORY 745-808, 756 (Martinus Nijhoff, 1983).

[48] Ian. Brownlie, The Principle of Non-Use of Force in Contemporary International Law, *in* W. E. BUTLER, THE NON-USE OF FORCE IN INTERNATIONAL LAW 17-27, 22 (Martinus Nijhoff, 1989).

[49] EMER DE VATTEL, II THE LAW OF NATIONS, OR THE PRINCIPLES OF NATURAL LAW [1758] 342 (Washington D.C., Carnegie Institution, 1916).

[50] JAMES CRAWFORD, THE INTERNATIONAL LAW COMMISSION'S ARTICLES ON STATE RESPONSIBILITY: INTRODUCTION, TEXT AND COMMENTARIES 281 (Cambridge University

Not every kind of act otherwise inconsistent with international obligations is considered to be a valid countermeasure. Specific prerequisites and condition must apply for them to be considered justified and lawful.[51] Actions that violate the fundamental obligation of States to refrain from the threat or use of force towards other States, i.e. what is nowadays known as forcible countermeasures, are considered unlawful[52] and have been prohibited as such ever since the adoption of the "Friendly Relations Declaration."[53] So are actions that violate fundamental human rights,[54] most easily identified as those that a State cannot derogate from even in times of war or emergency "threatening the life of the Nation,"[55] as well as actions that violate specific humanitarian obligations of the State.[56] Similarly, actions that violate peremptory norms[57] of international law, other than the ones just mentioned above, are unacceptable forms of countermeasures.[58] This last exception encompasses all other rules of a *iure cogens* nature that are not already covered by the aforementioned exceptions, without disregarding the fact that the latter might, and in fact have, also acquired the status of *ius cogens*.[59]

Since the purpose of taking countermeasures is none other than to pressure the offending State to comply with its international obligations, the actions chosen are expected to be of short duration, or to last for as long as the wrongdoing is in effect and to be lifted as soon as the wrongdoing ceases.[60] For this reason, the

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Press, Cambridge 2003); *see also* G.A. Res. 56/83, U.N. Doc. A/RES/56/83 (Dec. 12, 2001) [hereinafter ASR].

[51] Linos A. Sicilianos, Les réactions décentralisées à l'illicite: Des contre-mesures à la légitime défense (1990) (Librairie générale de droit et de jurisprudence, Paris), 501-525.

[52] ASR, *supra* note 50, art. 50, § 1(a).

[53] *Supra* note 33, Annex, Principle 1.

[54] ASR, *supra* note 50, art. 50, § 1(b).

[55] Article 4, 1966 International Covenant on Civil and Political Rights, 999 UNTS 1743; Article 15, 1950 European Convention on Human Rights and Fundamental Freedoms, ETS no. 5; Article 27, 1978 American Convention on Human Rights, 1144 UNTS 123.

[56] ASR, *supra* note 50, art. 50, § 1(c).

[57] ALEXANDER ORAKHELASHVILI, PEREMPTORY NORMS IN INTERNATIONAL LAW 57 (Oxford 2006); L. HANNIKAINEN, PEREMPTORY NORMS (JUS COGENS) IN INTERNATIONAL LAW (Helsinki, 1988).

[58] ASR, *supra* note 50, art. 50, § 1(d).

[59] *Id.* at 133.

[60] *Id.* art. 49, § 2; *see also id.* art. 53.

State exercising countermeasures must declare that it does so *ab initio*, so that the offending State can dully adjust its conduct. Declaring that specific actions constitute countermeasures retroactively, as a justification for otherwise unlawful conduct, has been considered a violation of international law.[61] It must be clearly understood that countermeasures are not a form of punishment inflicted by the injured State to the offending State, but only a method to speed up the return to international obligation normalcy.[62] As such, the means chosen by the injured State must not cause such damage to the interests of the offending State, so as to create non-rectifiable new situations.[63]

This last element is of extremely great importance, especially with regards to the subsequent international space law considerations, for two reasons. First, countermeasures are to be exercised by the injured State, on the basis of a wrong affecting it, only against the offending State and not against third States, whereby such an exercise would constitute a wrongful act.[64] And second, that although third States are not supposed to be directly targeted by the countermeasures, some "collateral damage" is to be expected and even tolerated, unless the affected third States have individual rights to the matter.[65]

It is thus obvious that the principle of proportionality is of paramount importance in exercising countermeasures.[66] The degree of proportionality is undoubtedly more easily established when the countermeasures applied are of similar nature to the injury inflicted by the non-compliance of the offending State with its international obligations.[67] A response disproportionately severe to the damage suffered by the injured State may be considered an unlawful act. In fact, if the countermeasures applied are

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[61] *Application of the Interim Accord of 13 September 1995*, Former Yugoslav Republic of Macedonia v. Greece, ICJ Records 2011, §122.

[62] ASR, *supra* note 50, at 129.

[63] *Id.* art. 49, § 3.

[64] Case Concerning the Gabcikovo-Nagymaros Project, Hungary *v.* Slovakia, ICJ Reports 1997, §83; Portuguese Colonies (Naulilaa incident) case, UNRIAA vol. II, p. 1011, at p. 1027 (1928); Cysne case, UNRIAA vol. II, p. 1035, at p. 1057 (1930).

[65] ASR, *supra* note 50, at 130.

[66] *See* Thomas M. Franck, *On Proportionality of Countermeasures in International Law*, 102 AM. J. INT'L L. 715 (2008).

[67] Case Concerning the Air Services Agreement between the United States of America and France of 27 March 1946, France v. USA, UNRIAA vol. XVIII, §83.

so prominently disproportionate to the wrongdoing of the offending State, they may even be in breach of the necessity principle and consequently fall short of the countermeasures permissibility rule crystallised in article 49 ASR. This is also a consideration of increased importance with regards to the subsequent space law analysis, in particular with relation to countermeasures against uses of force that do not reach the severity threshold of an armed attack.

B. The inherent right to self-defence and its exercise in outer space.

1. Analysis of the right to self-defence.

As mentioned above, before the adoption of the Briand-Kellogg Pact no justification was required for the initiation of hostilities.[68] The measure of war's legitimacy was one's own conviction about the fairness of the cause served,[69] essentially reflecting the Machiavellian concept of "that war is just which is necessary."[70] Although adequately defined in diplomatic exchanges relating to the Caroline incident[71] and later used in the Nurnberg and Tokyo trials,[72] the notion of self-defence was made relevant after the Briand-Kellogg Pact and certainly after the adoption of the UN Charter. However, the rather general and abstract wording of article 51 UN Charter has more often than not lead to varied interpretations of what self-defence actually comprises of, resulting in it being characterised as an open notion.[73] Scholars

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[68] Josef L. Kunz, *Bellum Justum et Bellum Legale*, 45 AM. J. INT'L L. 528, 529 (1951).

[69] LESLIE GREEN, THE CONTEMPORARY LAW OF ARMED CONFLICT 2 (Manchester, 1996).

[70] NICCOLO MACHIAVELLI, THE HISTORICAL, POLITICAL AND DIPLOMATIC WRITINGS, 1513, ch. II, n. 9 (translated by C. E. Detmold, Boston 1882).

[71] Correspondence between Great Britain and the United States, respecting the Arrest and Imprisonment of Mr. McLeod, for the Destruction of the Steamboat Caroline, (1840-41) 29 *British and Foreign State Papers* 1126, at 1138.

[72] Christopher Greenwood, *The Caroline*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, http://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e261?prd=EPIL (last visited Nov. 10, 2014).

[73] MARTII KOSKENNIEMI, FROM APOLOGY TO UTOPIA 591 (Cambridge, 2006).

have in fact strongly debated over the notion of inherency,[74] even invoking the notion of natural law,[75] while the ICJ concluded that inherency refers to the customary nature of the right.[76]

Despite certain claims to the contrary,[77] the right to self-defence may be triggered only under very specific circumstances, namely when a State is facing an armed attack,[78] and not any kind of use of force against it,[79] so as not to send "the mankind

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[74] Brun-Otto Bryde, *Self-Defence*, *in* R. BERNHARDT (ED.), 4 ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW 212-214, at 212 (North Holland Publishing Company, 1982); JEAN DELIVANIS, LA LEGITIME DEFENSE EN DROIT INTERNATIONAL PUBLIC MODERNE 49-51 (Paris, 1971); Louis Henkin, *Use of Force: Law and U.S. Policy*, *in* LOUIS HENKIN, STANLEY HOFFMANN ET AL. (EDS.), RIGHT V. MIGHT., INTERNATIONAL LAW AND THE USE OF FORCE 37-70, at 45 (Council on Foreign Relations Press, 1989); J. SALMON, 3 DROIT DES GENS 463 (Bruxelles, 1995).

[75] HUGO GROTIUS, THE RIGHTS OF WAR AND PEACE, Book II, Ch. I, s. III, at 76 (translated by A. C. Campbell) (Washington, London, 1901).

[76] *Nicaragua* case, *supra* note 34, §§175-176.

[77] *Id.*, Judge Schwebel Dissenting Opinion, §§167-168, 177; Case Concerning Oil Platforms, Islamic Republic of Iran *v.* United States of America, ICJ Reports 2003, Judge Simma Separate Opinion, §§12-13; Case Concerning Armed Activities on the Territory of the Congo, Democratic Republic of the Congo v. Uganda, ICJ Reports 2005, Judge Kooijmans Separate Opinion, §§25-26; MYRES S. MCDOUGAL, ET AL., HUMAN RIGHTS AND WORLD PUBLIC ORDER: THE BASIC POLICIES OF AN INTERNATIONAL LAW OF HUMAN DIGNITY 238-242 (Yale University Press 1980); Oscar Schachter, *The Right of States to Use Armed Force*, 82 MICH. L. REV. 1620, 1638 (1984); George K. Walker, *Anticipatory Collective Self-Defense in the Charter Era: What the Treaties Have Said*, 31 CORNELL INT'L L.J. 321 (1998); THOMAS FRANCK, RECOURSE TO FORCE, STATE ACTION AGAINST THREATS AND ARMED ATTACKS 75, 96, 107-108, 131-134 (Cambridge, 2002).

[78] ALFRED VERDROSS & BRUNO SIMMA, UNIVERSELLES VÖLKERRECHT: THEORIE UND PRAXIS, §470 (3rd ed., Duncker & Humblot, Berlin 1984); ANTONIO CASSESE, INTERNATIONAL LAW IN A DIVIDED WORLD 230 (Clarendon Press 1986); Rainee Hofmann, *International Law and the Use of Military Force Against Iraq*, 45 GER. Y.B. INT'L L. 9, 30 (2002).

[79] GEORG DAHM, II VÖLKERRECHT 413-414 (Köhlnammer 1961); IAN BROWNLIE, INTERNATIONAL LAW AND THE USE OF FORCE BY STATES 272-275 (Oxford 1963); Krysztof Skubiszewski, *Use of Force by States, Collective Security, Law of War and Neutrality*, *in* MAX SORENSEN (ED.), MANUAL OF PUBLIC INTERNATIONAL LAW 739-854, at 777-778 (St. Martin's Press 1968); Albrecht Randelzhofer, *in* RUDOLF BERNHARDT (ED.), 4 ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW 265-275, at 271 (North Holland Publishing Company 1982); D. Schindler, *Die Grenzen des völkerrechtlichen Gewaltverbots*, 26 BERICHTE DER DEUTSCHEN GESELLSCHAFT FÜR VÖLKERRECHT 11-47, at 16 (1986); Peter Malanczuk, *Countermeasures and Self-Defence as Circumstances Precluding Wrongfulness in the International Law Commission's Draft Articles on State Responsibility*, 43 ZAÖRV 705-812, 757 (1983); Albrecht Randelzhofer, *Article 51*, *in* BRUNO SIMMA (ED.), II THE CHARTER OF THE UNITED NATIONS, A COMMENTARY 788-806, at p. 790 (2nd ed., Oxford 2002).

back to square one."[80] Only the "most grave forms of use of force"[81] are considered to be an armed attack,[82] limiting the scope of article 51 UN Charter to cases of armed aggression,[83] and only permitting non-forcible countermeasures[84] to be taken in all other cases of unlawful use of force of lesser gravity. The attribution of the armed attack to a specific State is not considered a *conditio sine qua non* for the exercise of the right to self-defence.[85] Nevertheless, States are bound by customary international law[86] to exercise their right to self-defence respecting the principles of proportionality[87] and necessity,[88] the latter being the very *raison*

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[80] IDI, *Present Problems of the Use of Force in International Law – A. Sub-group on Self-defence* 75 (Santiago Session 2007), www.idi-iil.org.

[81] *Nicaragua* case, *supra* note 34, §191.

[82] Case Concerning Oil Platforms, Islamic Republic of Iran *v*. United States of America, ICJ Reports 2003, §51; Case Concerning Armed Activities on the Territory of the Congo, Democratic Republic of the Congo *v*. Uganda ICJ Reports 2005, §§131-135; Eritrea-Ethiopia Claims Commission, Partial Award (Jus ad Bellum), Ethiopia's Claims 1-8, 19/10/2005, §12.

[83] Yutaka Arai-Takahashi, *Shifting Boundaries of the Right of Self-Defence - Appraising the Impact of the September 11 Attacks on Jus ad Bellum*, 36 INT'L LAW. 1081, 1084 (2002); Josef Mrazek, *Prohibition of the Use and Threat of Force: Self-Defence and Self-Help in International Law*, 27 CAN. Y.B. INT'L L. 81, 91 (1989).

[84] ASR, *supra* note 50, art. 50, § 1; Linos-Alexandre Sicilianos, *La codification des contre-mesures par la Commission du droit international*, 38 R.B.D.I. 447-500 (2005).

[85] *Advisory Opinion on the Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territories*, ICJ Reports 2004, Judge Higgins Separate Opinion, §33; Secretary General's Statement, *Press Release*, UN Doc. SG/SM/7985 AFG/149 (2001); Linos-Alexandre Sicilianos, *L'invocation de la légitime défense face aux activités d'entités non-étatiques*, 1989 HAGUE Y.B. INT'L L. 147, 161; Christopher Greenwood, *International Law and the Pre-emptive Use of Force: Afghanistan, Al-Qaeda, and Iraq*, 4 SAN DIEGO INT'L L.J. 7, 17 (2003); Brenda L. Godfrey, *Authorization to Kill Terrorist Leaders and Those Who Harbor them: An International Analysis of Defensive Assassination*, 4 SAN DIEGO INT'L L.J. 491, 498 (2003); Tom Ruys and Sten Verhoeven, *Attacks by Private Actors and the Right of Self-Defence*, 10 J. CONFLICT & SEC. L. 289, 310 (2005); Kimberly N. Trapp, *Back to Basics: Necessity, Proportionality, and the Right of Self-Defence Against Non-State Terrorist Actors*, 56 INT'L & COMP. L.Q. 141 (2007).

[86] *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons,* ICJ Reports 1996, §141.

[87] CHRISTINE GRAY, INTERNATIONAL LAW AND THE USE OF FORCE 124 (2nd ed., Oxford 2004).

[88] Caroline case (1837), 29 *British and Foreign State Papers* 1137.

d'être of self –defence,[89] while always acting with due regard for "elementary considerations of humanity."[90]

In fact, the aforementioned elementary considerations of humanity are the absolute minimum that States have to abide by during any kind of armed conflict. For there is a whole set of rules, the majority of which now considered of customary nature,[91] that is applicable as soon as an armed conflict commences: international humanitarian law. Codified in The Hague and Geneva systems,[92] international humanitarian law can be considered to rotate around three major principles: distinction, necessity and proportionality.

The principle of distinction first appeared in the St Petersburg Declaration and refers to the need to restrict armed conflict only between belligerent armed forces.[93] Now codified in Article 48 of the First Additional Protocol to the Geneva Conventions,[94] it demands that combatants always distinguish themselves from civilians and that civilian property is not mistaken for military target. Attacks against non-specific military targets, or by means and methods that cannot be targeted exclusively or contained sole-

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[89] Georges Abi-Saab, *Cours général de droit international public*, 207 R.C.A.D.I. 9, 371 (1987).

[90] Common article 3 to the 1949 Geneva Conventions; *Corfu Channel* case, *supra* note 46, at 22; *Nicaragua* case, *supra* note 34, §218; ITLOS, *M/V* Saiga (No.2) case, 1999, §§155-156; Pierre-Marie Dupuy, *Les "considérations élémentaires de l'humanité" dans la jurisprudence de la Cour internationale de justice*, *in* MELANGES EN L'HONNEUR DE NICOLAS VALTICOS - DROIT ET JUSTICE 117-130, at 125-127 & 130 (Pedone 1999).

[91] JEAN-MARIE HENCKAERTS & LOUISE DOSWALD-BECK, CUSTOMARY INTERNATIONAL HUMANITARIAN LAW, VOLUME I: RULES, ICRC (Cambridge 2005).

[92] 1899 Convention with Respect to the Laws and Customs of War by Land and its Annex: Regulations Respecting the Laws and Customs of War on Land, 187 CTS 429 (1898-1899); 1907 Convention concerning the Laws and Customs of War on Land and its Annex: Regulations Respecting the Laws and Customs of War on Land, 205 CTS 277 (1907); 1907 Convention for the Adaptation to Maritime Warfare of the Principles of the Geneva Convention, 2 AM. J. INT'L L. 153 (Supp. 1908); 1949 Geneva Convention Relative to the Treatment of Prisoners of War, 75 UNTS 135; 1949 Geneva Convention Relative to the Protection of Civilian Persons in Time of War, 75 UNTS 287; 1977 Additional Protocol I to the Geneva Conventions, 1125 UNTS 3; 1977 Additional Protocol II to the Geneva Conventions, 1125 UNTS 609.

[93] 1868 Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight, www.icrc.org.

[94] *Supra* note 91.

ly against military targets are thus violating the distinction principle.[95]

As far as the principle of necessity is concerned, within the context of IHL, the emphasis is put on the balance between the military advantage sought by the undertaking of an operation versus the loss that will result to the enemy from said operation.[96] The main purpose of the principle is to prevent unnecessary suffering between belligerents.

Finally, the principle of proportionality complements the other two, by placing an obligation on belligerents to act in such a way so as to spare civilians, civilian objects and other non-legitimate, non-military targets.[97] Attacks with excessive civilian losses, of either life or property, even if incidental, must never be launched, as they would breach Articles 2 and 57 of Additional Protocol I to the Geneva Conventions.

2. Self-defence and its consistency with the corpus iuris spatialis.

It is apparent that when it comes to the use of force space cannot be treated in isolation of general international law.[98] According to article III OST, spatial activities of States are to be carried out "… in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security…" The wording of Article III makes it clear that general international law is to be applied in parallel and in addition to general space law, in accordance with the principle of the systemic interpretation of treaties.[99] The specific reference to the UN Charter is consistent with the provision of article 103 thereof, whereby in case of conflict between the obligations

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[95] Michel Bourbonnière, *Law of Armed Conflict (LOAC) and the neutralisation of satellites or* ius in bello satellitis, 9 J. OF CONFLICT & SECURITY LAW 43-69, at p. 48 (2004).

[96] *Id.* at 47.

[97] Article 57 Additional Protocol I to the Geneva Conventions.

[98] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW, A TREATISE 501 (Ashgate 2009); Louis Haeck, *Aspects juridiques de certaines utilisations militaires de l'espace*, 21-I ANNALS AIR & SPACE L. 65, 92 (1996).

[99] 1969 Vienna Convention on the Law of Treaties, art. 31,§1(c), 1155 UNTS 331 [hereinafter VCLT].

arising out of various international instruments and the Charter, the latter prevails.

The inherent right to self-defence is, as noted above, of a dual character: it has both a conventional and a customary law dimension. It is thus evident that the right to self-defence is to be taken into consideration in relation to space activities of States, precisely on the merit of its dual nature. With regard to this last comment, there are two considerations to be made: first, whether States are allowed to defend their satellites from hostile actions and second, whether States have the right to use satellites when exercising their right to self-defence.

As per the first consideration, it is necessary to examine whether an attack on a satellite would trigger the right to self-defence; in other words, if it reaches the gravity threshold established by international law. In the *Nicaragua* case, the ICJ ruled that attacks of the USA on Nicaraguan ports and oil installations, admittedly investments of substantial economic value, were of such gravity as to be considered an armed attack.[100] It would be thus reasonable to assume that an attack on a satellite, an equally costly investment, could trigger the inherent right to self-defence. But even if attacks against just a satellite may someday be regarded as insufficient, or in the case of nano-satellites, in application of the cumulative effects doctrine established in the *Oil Platforms* judgement,[101] attacks on multiple satellites can still be equated to an attack of sufficient gravity so as to entitle a State to exercise its right to self-defence.

Pursuant to the aforementioned, in exercising their right to self-defence in space States are still under the obligation to comply with the "minimum test"[102] of necessity and proportionality. Where a State has multiple methods by which to protect its satellite, it should choose the less drastic one, especially in view of the rights of non-involved third parties. In case, for example, that the attack actually originates from another satellite, the use of an anti-satellite missile in response, though undoubtedly efficient, would nevertheless be deemed disproportionate and unnecessary. Its use would create a cloud of space debris endangering other

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[100] *Nicaragua* case, *supra* note 34, §195.

[101] Case Concerning Oil Platforms, ICJ Reports 2003, §72.

[102] GRAY, *supra* note 87, at 124.

space objects of the defending party, the aggressor and innocent third parties alike[103] in breach of their rights under international law. Alternate methods, such as the jamming of the signals of the aggressor's satellite,[104] or even a "cyber-attack"[105] have been suggested as proportionate, acceptable defensive mechanisms. It is clear that these methods are in principle violating other rules of international law;[106] however since they are performed in self-defence, the wrongfulness of such actions would under such circumstances be precluded.[107] Evidently, if the attack in question originates from a ground station, then States are entitled to act in self-defence in conformity with their international rights and obligations, as analysed under (I. B. 1.).

As per the second consideration, i.e. whether States have the right to use satellites when exercising their right to self-defence, the answer has already been partially given. If the satellite carries weapon systems permissible under article IV OST and is found in conditions permitting actions in self-defence, then those systems can be lawfully used. The remaining part of this consideration has to do with the use of satellite systems in cases of attacks originating from and directed to targets on the surface of the Earth, including the airspace.

Keeping into consideration the prohibition to place nuclear weapons or weapons of mass destruction in orbit or on the Moon and other celestial bodies,[108] there seems to be no prohibition of targeting space weapons towards the Earth. The only explicit exception is to be found in article 3§2 of the Moon Agreement,[109] whereby "…it is prohibited to use the Moon in order to commit any such act [i.e. threat or use of force, any other hostile act or threat thereof] or to engage in any such threat in relation to the Earth…" Read in conjunction with article 1§2, which equates the regime

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[103] *See generally* Mirmina, *supra* note 8; Edward F. Hennessey, *Liability for Damage Caused by the Accidental Operation of a Strategic Defense Initiative System*, 22 CORNELL INT'L L.J. 317 (1988).

[104] LYALL & LARSEN, *supra* note 98, at 526.

[105] *See generally The Use of Force in Response to Cyber Attack on Commercial Space Systems*, *supra* note 22.

[106] ITU CONSTITUTION, art. 4, www.itu.org.

[107] ASR, *supra* note 50, art. 21.

[108] *See* OST, *supra* note 1, art. 4; Moon Agreement, *supra* note 4, art. 3, §§3-4.

[109] *See* Moon Agreement, *supra* note 4, art. 3, §2.

applicable to the Moon to that of orbits or other trajectories to or around it, one could argue that space law only prohibits the targeting of Earth by any kind of weapon so specifically located. In other words, if a weapon system is located in any orbit around the Earth, but not around the Moon or its orbits and trajectories, then it could, in fact, be used against targets on the Earth, always in conformity with international law and the UN Charter.[110]

Since the UN Charter makes no reference to weapon systems, it is within the realm of general international law that the answer has to be found. The body of law dealing with the conduct of States during hostilities is the *ius in bello*[111] and has specific provisions relating to the prohibition of specific kinds of weapons.[112] In fact, under international law "the right of the Parties to the conflict to choose methods or means of warfare is not unlimited,"[113] or, in the words of the ICJ "methods and means of warfare, which would preclude any distinction between civilian and military targets, or which would result in unnecessary suffering to combatants, are prohibited."[114]

In determining whether the use of satellite technology or satellite weapon systems would be lawful in self-defence, one would

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[110] *See* OST, *supra* note 1, art. 3; Moon Agreement, *supra* note 4, art. 2.

[111] *Supra* note 91.

[112] *The Hague Declarations of 1899 (IV, 1) and 1907 (XIV) Prohibiting the Discharge of Projectiles and Explosives from Balloons*, *in* JAMES B. SCOTT (ED.) THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907 220 (Oxford University Press, New York 1915); *The 1899 Hague Declaration (IV, 2) concerning Asphyxiating Gases*, *in* James B. SCOTT (ED.) THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907 225 (Oxford University Press, New York 1915); *The 1899 Hague Declaration (IV, 3) concerning Expanding Bullets*, *in* JAMES B. SCOTT (ED.) THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907 227 (Oxford University Press, New York 1915); 1925 Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, 94 LNTS 65; Protocol on Non-Detectable Fragments of the 1980 Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons, 1342 UNTS 168; Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices, 1342 UNTS 168; Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons, 1342 UNTS 171; 1971 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxic Weapons and on their Destruction, 1015 UNTS 163; 1976 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 16 ILM 90.

[113] 1977 Additional Protocol I to the 1949 Geneva Conventions, 1125 UNTS 3, art. 35,§1.

[114] *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons,* ICJ REPORTS 1996, §95.

have to examine whether said systems may be prohibited as non-discriminatory by the *ius in bello*. Given that weapons of mass destruction and nuclear weapons are *ipso facto* prohibited to be sent to space, any kind of weapon that would not fall under the prohibitive scope of any of the cited treaties could be lawfully used in self-defence. Truth be told, it could be claimed that most of the prohibited weapons are not sophisticated enough to be made part of a satellite system, and that smarter weapons are designed and developed, that are not (yet) prohibited by any international law instrument. However, even in this case, the use of these "smart weapons" must be proper,[115] meaning that the distinction between combatants and civilians must always be upheld.[116]

Pursuant to the above, the use of weapons from space against targets on Earth while exercising the right of self-defence is permissible under international (space) law, as a recognised customary exception to the prohibition or threat of use of force and under the prerequisites of necessity and proportionality.

C. Action under Chapter VII of the UN Charter.

1. General overview of the authorisation regime.

Having already analysed the regime governing the first exception to the prohibition of threat or use of force rule, self-defence, it is now time to move to the second, and last, exception, i.e. action taken by the Security Council under its competences under Chapter VII of the UN Charter.

Indeed, in order to fulfil the primary purpose of the UN, which is "to maintain international peace and security, and […] to take effective collective measures for the prevention and removal of threats to the peace…"[117] the Members of the Organisation have "confer[ed] on the Security Council primary responsibility for the maintenance of international peace and security."[118]

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[115] Dakota S. Rudesill, *Precision War and Responsibility: Transformational Military Technology and the Duty to Care Under the Laws of War*, 32 YALE J. INT'L L. 517 (2007).

[116] 1977 Additional Protocol I to the 1949 Geneva Conventions, 1125 UNTS 3, art. 48.

[117] U.N. Charter art. 1, para. 1.

[118] *Id.* art. 24, para. 1.

While the powers of the Security Council are defined in Chapters VI, VII, VIII and XII of the UN Charter, it is only its actions under Chapter VII that fall under the permissible exceptions to the rule of prohibition of threat or use of force. Entitled "Action with Respect to Threats to the Peace, Breaches of the Peace and Acts of Aggression" Chapter VII of the UN Charter describes in detail the procedure to be followed and the kind of action that can be undertaken.

As already explained, the threat or use of force has been rendered unlawful in inter-State relations ever since the adoption of the UN Charter. However, this does not mean that situations threatening or breaching the peace or possible acts of aggression have never taken place ever since. In fact, quite the opposite is accurate. And even in the recent past, the number of situations that could disrupt international peace and security was further increased by the adoption of the famous "*Agenda for Peace*,"[119] proposed by the then UN Secretary General Mr Boutros-Boutros Ghali.

According to Article 39 of the UN Charter, upon determination of a situation as endangering international peace and security, the Security Council "shall make recommendations or decide what measures shall be taken"[120] in order to remedy the situation. The decisions made under the competences included in this Chapter, even though decisions of an international organisation, are mandatory and binding upon the Member States of the UN, through the combined application of Articles 25 and 103 of the Charter. This point is of particular significance, especially with regards to the content of an authorisation resolution and the means suggested or intended for its implementation.

The measures available to the Security Council are both forcible and non-forcible. The latter will be discussed under title D of the present part of this Article. The option to use force against a State determined to be, somehow, disrupting international peace and security is provided for in Article 42 of the Charter, which reads as follows:

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[119] G.A. Res. 47/277, U.N. Doc. A/47/277-S/24111 (June 17, 1992).

[120] U.N. Charter art. 39.

> Should the Security Council consider that measures provided for in Article 41 would be inadequate or have proved to be inadequate, it may take such action by air, sea, or land forces as may be necessary to maintain or restore international peace and security. Such action may include demonstrations, blockade, and other operations by air, sea, or land forces of Members of the United Nations.[121]

It is a conventional obligation of the Member States of the UN to have contingences of armed forces available at all times, in order to be used by the UN, so as to implement the decisions of the Security Council with regards to the restoration of international peace and security.[122] Special reference is made in the Charter for the need to have air-force contingents readily available,[123] as at the time of the adoption of the Charter, those were the fastest weapons at hand to address a situation, their efficiency having been proven throughout the numerous battlefields of World War II. However, in actual UN practice, although the Security Council could freely designate which of the Member States shall participate in the operation against the perpetrator State, the usual *modus operandi* is that the Council shall make an open invitation to the States "able and willing" to participate in the operation.[124] Such coalitions of able and willing can either be formed by individual States jointly engaging their armed forces *ad hoc*, or they can be undertaken by other (regional) international agencies or organisations, in which the States are already participating.[125]

This last option acts as a meeting point between Chapters VII and VIII of the UN Charter. Chapter VIII deals with "Regional Arrangements," which is basically the term used to describe regional organisations of military, amongst other, purposes, such as the North Atlantic Treaty Organisation (NATO), the former Warsaw Covenant coalition, the Economic Community of Western African States (ECOWAS) etc. In fact, the Security Council, on behalf of the UN, encourages the creation of such regional arrangements, the sole prerequisite set being that their objectives

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[121] *Id.* art. 42.
[122] *Id.* arts. 43- 45.
[123] *Id.* art. 45.
[124] *Id.* art. 48, para. 1.
[125] *Id.* art. 48, para. 2.

are not inconsistent with those of the Charter.[126] The relation envisioned by the authors of the Charter with regards to this regional arrangement and the Security Council is perfectly clear: the former are to be subservient to the latter. This is apparent by the wording of the entire Chapter. The regional arrangements are to be the first to deal with disputes arising among their members, before they are referred to the Security Council, obligating them, thus, to act as a first line of auxiliary support with its workload.[127] The clearest evidence of this subservient relation however, is provided for in Articles 53 and 54 of the UN Charter.

The provisions of Article 53 clarify that the Security Council can utilize the regional organisations in order to enforce its decisions under Chapter VII with regards to the restoration of peace and security. On the contrary though, and further solidifying the dependence of the regional organisations to the Council, no regional organisation can take unilateral action against a State violating the peace without the *expressis verbis* authorisation of the Security Council for such action. The only exception recognised for such unilateral action is action taken against an "enemy State," which according to Articles 53§2 and 107 signifies a State that at the end of World War II was considered an enemy to the signatories of the Charter. The United Nations counting nowadays 193 members, all the former Axis alliance States being included therein, the "enemy State" provisions are rendered obsolete and inapplicable.

There have only been three occasions that a regional arrangement has taken action unilaterally,[128] without the prior, express authorisation of the Security Council. The first was when the ECOWAS States undertook forcible action against Liberia in 2003.[129] At the time when the operations against Liberia began, the ECOWAS States were acting on their own accord, having no

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[126] *Id.* art. 52.

[127] *Id.* art. 52, para. 2.

[128] Jochen A. Frowein, *Legal Consequences for International Law Enforcement in Case of Security Council Inaction*, *in* JOST DELBRÜCK (ED.), THE FUTURE OF INTERNATIONAL LAW ENFORCEMENT: NEW SCENARIOS – NEW LAW? 111-24 (Duncker und Humblot, Berlin 1993).

[129] ECOWAS Standing Mediation Committee, Decision A/DEC.1/8/1990; *see also* Jeremy Levitt, *Humanitarian Intervention by Regional Actors in Internal Conflicts: The Cases of ECOWAS in Liberia and Sierra Leone*, 12 TEMP. INT'L & COMP. L.J. 333 (1998).

authorisation from the Security Council. In fact, the Council adopted a relevant authorisation resolution some five to seven hours after the commencement of operations.[130] Due to the time zone difference between Africa and the UN Headquarters in New York, it appears that the resolution was issued just before the beginning of operations. By actually covering up the unilateral actions of ECOWAS, the Security Council tried to make the situation appear as if it developed at all times under its auspices, so as to not entertain any doubts against its supreme authority over regional arrangements concerning operations for the restoration of international peace and security.

The second occasion was NATO operating in Kosovo in 1998.[131] The open conflict that had commenced in the same year between the Serbian forces and the Albanian-Kosovar forces resulted in a substantial death toll for the latter and led to the displacement of more than 400,000 people. NATO decided to intervene, in order to resolve what it considered to be a threat to the peace, security and stability in the region of the Former Republic of Yugoslavia. After a series of meetings at a ministerial level for consideration of possible actions with regards to the situation,[132] NATO authorised the beginning of air-strikes against Serbia on 13 October 1998, as a means of supporting the on-going diplomatic efforts by exercising pressure on the Serbian Government to withdraw its military forces from Kosovo.[133] Whilst the Security Council had expressed its deep concerns about the escalation of conflict between the two sides within the FRY territory[134] and commended NATO for the establishment of its air verification mission in the area,[135] in none of these two occasions did it authorise the use of force against Serbia. NATO claimed that it was reviving the spir-

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[130] S.C. Res. 1497, para. 1, U.N. Doc. S/RES/1497 (Aug. 1, 2003).

[131] Klaus D. Naumann, *Rolle und Aufgaben der NATO nach dem Gipfel 1999 und erste Erfahrungen aus dem Kosovo-Konflikt*, *in* KNUT IPSEN ET AL. (EDS), WEHRRECHT UND FRIEDENSSICHERUNG: FESTSCHRIFT FÜR KLAUS DAU ZUM 175-91 (Geburtstag, Luchterhand Neuwied 1999).

[132] North Atlantic Council meeting at Foreign Minister Level of May 28, 1998; North Atlantic Council meeting at Defence Minister Level of June 12, 1998.

[133] NATO, *NATO's Role in Relation to the Conflict in Kosovo*, http://www.nato.int/kosovo/history.htm#1.

[134] S.C. Res. 1199, U.N. Doc. S/RES/1199 (Sept. 23, 1998).

[135] S.C. Res. 1203, U.N. Doc. S/RES/1203 (Oct. 24, 1998).

it[136] of Resolution 1199; however there is little doubt that its action in that case was unlawful.[137]

The third occasion was, again, the USA and its allies operating against Iraq in 2003, after the terrorist attack on the World Trade Centre. The Security Council had issued no resolution authorising action against Iraq. There were two argumentation lines at the time trying to justify the lawfulness of the undertaken action. The first was that the USA was acting pre-emptively in self-defence against a State supporting terrorist groups planning to act against it. However, according to the *Caroline* doctrine analysed above, a State can only act in self-defence when faced with a present and actual attack, or *in extremis* with an imminent one. However, that was not the case with Iraq. The second one was that there was, in fact, authorisation by the Security Council, through the revival of the relevant resolutions about the no-fly zone issued during the first Gulf War.[138] By arguing that Iraq had violated its obligations set under those resolutions, the coalition was entitled to take action against it, so as to restore the *status quo* in the region. The attempted justification was drawn along the lines of *Operation Provide Comfort*,[139] *No-fly Zones*, or Security Council Resolutions 1154 (1998) and 1441 (2002). This fall-back clauses argumentation line was heavily criticized by academics and scholars world-wide,[140] who had already considered the revival of powers

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[136] Bruno Simma, *NATO, the UN and the Use of Force: Legal Aspects*, 10 EURO. J. INT'L L. 1 (1999); Christopher Greenwood, *International Law and the NATO Intervention in Kosovo*, 49 INT'L & COMP. L.Q. 926 (2000).

[137] Nicolas Valticos, *Les droits de l'homme, le droit international et l'intervention militaire en Yougoslavie – Où va-t-on? Éclipse du Conseil de Sécurité ou réforme du droit de veto?*, 104 *REVUE GENERALE DE DROIT INT'L PUB. 5, 15-18* (2000); Marcelo G. Kohen, *L'emploi de la force et la crise du Kosovo: vers un nouveau désordre juridique international*, 32 REVUE BELGE DE DROIT INT'L 122 (1999); Serge Sur, *L'affaire du Kosovo et le droit international: points et contrepoints*, 45 ANNUAIRE FRANÇAISE DE DROIT INT'L 280 (1999); Christine Chinkin, *The Legality of NATO's Action in the Former Republic of Yugoslavia (FRY) under International Law*, 49 INT'L & COMP. L.Q. 910 (2000).

[138] S.C. Res. 678, U.N. Doc. S/RES/0678 (Nov. 29, 1990).

[139] Gordon W. Rudd, *Humanitarian Intervention: Assisting the Iraqi Kurds in Operation Provide Comfort, 1991* (United States Army Center of Military History, Washington, D.C. 2004), www.history.army.mil/html/books/humanitarian_intervention/index.html.

[140] Michael M. Collier, *The Bush Administration's Reaction to September 11: A Multilateral Voice or a Multilateral Veil?*, 21 BERKELEY J. INT'L L. 715, 725 (2003).

scenario in lieu of an implicit authorisation to be dubious.[141] Contrary to the ECOWAS scenario however, the situations in Iraq and Kosovo involved at least one permanent member of the Security Council, effectively not allowing for the adoption of a potential resolution condemning this unilateral unauthorised action, by the exercise of the veto right. Hence, the lack of action by the Security Council on both these instances should not be misread as a silent endorsement of the activities of the regional organisations / coalitions.[142]

Last but not least, Article 54 of the UN Charter demands that the Security Council remain at all times informed about the progress of actions undertaken by regional arrangements under its authorisation, or for actions that the arrangements are contemplating to take, so as to provide its authorisation. This being the concluding article of Chapter VIII, it is more than evident that a regional international organisation could potentially undertake action for the restoration of international peace and security, exclusively within the context of an inferiority relation to the Security Council.[143]

It goes without saying that when the Security Council authorises the use of force against a State, that State must not take armed action against the forces acting on behalf of the UN. This is the natural result of the combined interpretation of Articles 25 and 103 of the Charter, according to which States are to comply with the decisions of the Security Council, even if they have conflicting conventional obligations by other instruments; whereas the argument of self-defence cannot be invoked, since the operations for the restoration of peace cannot be considered an armed attack against the perpetrator State. Similarly, third States that are not participating in the operation must not provide support to the State against which action is taken, as a result of their obligations under articles 25, 49 and 103 of the Charter.

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[141] GRAY, *supra* note 87, at 195.

[142] Lori Fisler Damrosch, *Concluding Reflections*, *in* LORI FISLER DAMROSCH (ED.), ENFORCING RESTRAINT: COLLECTIVE INTERVENTION IN INTERNAL CONFLICTS 348, 357 (Council on Foreign Relations 1993); Anthony D'Amato, *Israel's Air Strike upon the Iraqi Nuclear Reactor*, 77 AM. J. INT'L L. 586 (1983); Leonard C. Meeker, *Defensive Quarantine and the Law*, 57 AM. J. INT'L L. 515 (1963).

[143] IDI, *Present Problems of the Use of Force in International Law, Sub-group on Humanitarian Intervention* 179 (Santiago Session 2007), www.idi-iil.org.

2. The "all means necessary" mantra: can the purpose justify all sorts of actions?

When a determination that a specific situation threatens or breaches international peace and security has been made and the above described procedure has been followed, the Security Council, acting under Chapter VII, adopts a resolution authorising the use of force against the perpetrator State of said threat or breach.

There are two elements that must and can be detected in all Security Council resolutions authorising the use of force. First, the last clause of the preamble always states that the Council is acting under its Chapter VII authority. And second, the call to arms will be given by the inclusion of the standard phrase that "States use all means necessary" for the enforcement of the resolution, in accordance with Security Council practice.[144]

With regards to military activities undertaken in or related to space, the key phrase "all means necessary" can be the basis for some very interesting considerations. As mentioned above, when it comes to forcible action Article 42 of the UN Charter allows for "operations by air, sea or land forces." No reference is being made to action by, through or towards Space. Naturally, one cannot ignore the fact that Man's conquest of Outer Space was, at the time of the adoption of the UN Charter, nothing short of science fiction. It would be easy to claim that after the beginning of the space era a relevant adjustment could have been made to the Charter, if one were to overlook the extremely cumbersome process required to accomplish such a feat. Nevertheless, the Charter of the United Nations is first and foremost a (multilateral) international treaty, and as such, it should be interpreted according to the customary rules of treaty interpretation codified in the VCLT. An interpretation based on the ordinary meaning of the article wording[145] would result in leaving Space completely outside the scope of the aforementioned provision. The possibility that the drafters of the Char-

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[144] S.C. Res. 82, U.N. Doc. S/RES/82 (June 25, 1950); S.C. Res. 83, U.N. Doc. S/RES/83 (June 27, 1950); S.C. Res. 84, U.N. Doc. S/RES/84 (July 7, 1950); S.C. Res. 38/39, U.N. Doc. A/RES/38/39 (Dec. 5, 1983); S.C. Res. 546, U.N. Doc. S/RES/546 (Jan. 6, 1984); S.C. Res. 574, U.N. Doc. S/RES/574 (Oct. 7, 1985); S.C. Res. 686, U.N. Doc. S/RES/686 (Mar. 2, 1991); S.C. Res. 687, U.N. Doc. S/RES/687 (Apr. 3, 1991); S.C. Res. 688, U.N. Doc. S/RES/688 (Apr. 5, 1991); S.C. Res. 1078, U.N. Doc. S/RES/1078 (Nov. 9, 1996); S.C. Res. 1080, U.N. Doc. S/RES/1080 (Nov. 15, 1996).

[145] VCLT, *supra* note 99, art. 31,§1.

ter might have instinctually equated Space with air, and thus included the former in the context of the latter, is rather unlikely. In fact, as much as Space was an unattainable goal back in the mid-1940's, it was not totally unknown to the international community, or completely out of its "grasp." Indeed, already in the 1920's the then nascent International Radio Consultative Committee (Comité Consultatif International des Radio Communications – CCIR) had studied and researched the propagation of high-frequency radio-waves in the Ionosphere, the outer layer of the Earth's atmosphere and the ITU and its predecessors had, based on these studies, already addressed relevant regulatory problems,[146] before the adoption of the UN Charter. Therefore, it would be rational to assume that if the Charter drafters wanted to include Outer Space in the provision of Article 42, they could have very well done so. It is also true that Article 42 makes references to "air forces" and not just "air" as a medium through which to operate. The lack of specialised "space forces" even today, would make any further discussion moot, but for one point: the forces expressly mentioned are bound to operate, chiefly, through their respective domains, drawing thus a framework of action envisioned by the Charter. The possibility, however, of allowing a domain where such a great variety of human activities take place to be beyond the reach of the UN, especially for purposes pertaining to the restoration of international peace and security, would be absolutely absurd and would not contribute to solidifying the rule of law.[147]

It would, thus, be more prudent to discuss if the means utilised by said forces can include satellites or satellite technology in general. This question basically coincides with the on-going discussion about what constitutes a "weapon" nowadays:[148] is it just a solitary piece of equipment of any given kind, or is it rather a compilation of different units, which create a weapon system? The evolution of technology and the subsequent trend demonstrated by

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[146] Richard E. Butler, *The ITU a Pioneer in Space Law* 1-2 (ITU General Secretariat, Geneva 1983).

[147] HERSCH LAUTERPACHT, THE DEVELOPMENT OF INTERNATIONAL LAW BY THE INTERNATIONAL COURT 213 (Stevens & Sons, London 1958).

[148] Duncan P. Blake & Joseph S. Imburgia, *'Bloodless Weapons'? The Need to Conduct Legal Reviews of Certain Capabilities and the Implications of Defining them as 'Weapons'*, 66 A.F. L. REV. 157, 168-172 (2010).

the instruments outlawing specific kinds of weapons[149] would suggest that the international community is now discussing in terms of weapon systems. And if, as discussed above, a State is allowed to use satellites while exercising its right to self-defence, then, in a reasoning *de minore ad maius*, satellites and satellite technology that are part of a weapon system utilised by any of the three forces identified by Article 42, can indeed be used for the purposes of a Chapter VII operation. In fact, the first Gulf War was considered as the first space war, due to the extended use of space-related military technologies by the allied forces against Iraq.[150]

Seeing that the use of space related weapons is not precluded on the basis of Article 42 of the UN Charter, one would then have to wonder whether the Security Council could ever authorise the destruction of a satellite considered threatening *per se*, or being part of a weapon system used by the perpetrator State. As already analysed under the self-defence framework,[151] the actual destruction of a satellite by e.g. the use of an ASAT weapon would create an orbiting cloud of debris, endangering the space assets of third States. Such an outcome would be manifestly disproportionate to the military gain of the destruction that it would not be possible to be accepted as collateral damage. The alternate methods proposed by scholars and experts could be applied in this scenario too, their otherwise wrongful nature being precluded, this time, on the basis of articles 25 and 103 of the UN Charter.

The last consideration that has to do with a broader question: could the Security Council order a State considered to be threatening international peace and security to refrain from using space at all? In other words, if a State is considered by the international community as being a latent threat to the peace and that State announces the launch of a space object, even for civilian purposes, could the Security Council, order it to abort the launch and cancel its space programme all together, so as to eliminate the threat, basically depriving that State of all its rights under the OST?

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[149] *Supra* note 92.

[150] *Legal Issues Relating to the Global Public Interest in Outer Space*, *supra* note 14, at 98; LaToya Tate, *The Status of the Outer Space Treaty at International Law during "War" and "Those Measures Short of War"*, 32-I J. SPACE L. 177, 200 (2006); Richard A. Morgan, *Military Use of Commercial Communication Satellites: A New Look at the Outer Space Treaty and the "Peaceful Purposes"*, 60 J. AIR L. & COM. 237, 265 (1994).

[151] *See* Part. I. A. 2.

Would such an order under a Chapter VII resolution be an acceptable method of restoring international peace and security? This is a highly complicates issue, having as many legal aspects as it does political. For some times, various States are considered friends or foes depending on the current political climate and the interests of different players in the political field. The classification of a State as one that threatens the stability of a region or of the whole international community in general is primarily a political decision. And while there will always be legal elements behind such a dispute,[152] one would always wonder what was that weighed more for the Security Council, should ever such a resolution be adopted.

Only two entities could potentially determine in an authentic manner if such a decision is more political than legal: the Security Council itself and the International Court of Justice. It is evident that the first would never question the legality of its own decisions. As for the ICJ, it is a well-known fact that it is the principle judicial organ[153] of the Organisation, and thus, bound by its purposes.[154] However, absent any specific hierarchy between the six principle organs of the United Nations, the Court cannot judicially review any decisions made by them.[155] The *travaux préparatoires* of the Charter clearly reinforce this interpretation, since it was so decided that each organ would be responsible for interpreting the Charter's particular provisions applicable to its function.[156] Fun-

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[152] SS Wimbledon case, United Kingdom of Great Britain and Northern Ireland, France, Italy and Japan *v.* Germany, PCIJ Series A no. 1, Judgment of 17 August 1923, p. 20.

[153] U.N. Charter arts. 7 & 92; Article 1 ICJ Statute, Annexed to the UN Charter; *Wall* Advisory Opinion, *supra* note 85, §44; Stephen Schwebel, *Relations Between the International Court of Justice and the United Nations*, *in* MICHEL VIRALLY (ED.), LE DROIT INTERNATIONAL AU SERVICE DE LA PAIX, DE LA JUSTICE ET DU DÉVELOPPEMENT 434 (Paris 1991).

[154] U.N. Charter art. 1, para. 1; Malcolm Shaw, The Security Council and the International Court of Justice: Judicial Drift and Judicial Function, *in* SAM MULLER ET AL. (EDS), THE INTERNATIONAL COURT OF JUSTICE: ITS FUTURE ROLE AFTER FIFTY YEARS 219-259, at 237 (Martinus Nijhoff 1997); KENNETH KEITH, THE EXTENT OF THE ADVISORY JURISDICTION OF THE INTERNATIONAL COURT OF JUSTICE 146 (Sijthoff 1971).

[155] KAIYAN KAIKOBAD, THE INTERNATIONAL COURT OF JUSTICE AND JUDICIAL REVIEW: A STUDY OF THE COURT'S POWERS WITH RESPECT TO JUDGMENTS OF THE ILO AND UN ADMINISTRATIVE TRIBUNALS 11 (Kluwer International 2000).

[156] 13 UNCIO 1945, at 709-710; *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) notwithstanding Security Council Resolution 276*, ICJ Reports 1971, at 45; *id.*, Separate Opinion Judge De Cas-

damental as it is, the UN Charter is not a constitution with a system of checks and balances[157] and the ICJ, although described as the guardian of legality for the international community,[158] is not the "guardian of the Charter" in the way federal constitutional courts are.[159] The Court has, indeed, repeatedly refused[160] to review the decisions of other UN organs and, in the *Lockerbie* case, those of the Security Council. Besides, judicial recourse against the decisions of any organ of the United Nation is not provided for in the Charter, so such proceedings could never be initiated before the ICJ. But even if somehow a relevant case was brought before the Court or it was to be reviewed incidentally through contentious proceedings,[161] it would still have to be dismissed. For the legal interests of the UN "would form the very subject-matter of the decision" and, as the UN lacks *locus standi*,[162] the Court proceeding would violate the *Monetary Gold* principle.[163]

Would the affected by the resolution State then remain unprotected under international law, should indeed said resolution

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tro, at 180; Geoffrey R. Watson, *Constitutionalism, Judicial Review, and the World Court*, 34 HARVARD INT'L L.J. 1, 13 (1993).

[157] William Michael Reisman, *The Constitutional Crises in the United Nations*, 87 AM. J. INT'L L. 85, 95 (1993).

[158] Questions of Interpretation and Application of the 1971 Montreal Convention arising from the Aerial Incident at Lockerbie, Libyan Arab Jamahiriya *v.* United States of America & United Kingdom, Provisional Measures, ICJ Reports 1992, Separate Opinion Judge Lachs, §138.

[159] SHABTAI ROSENNE, THE WORLD COURT: WHAT IT IS AND HOW IT WORKS 36 (Brill 1989); Scott S. Evans, *The Lockerbie Incident Cases: Libyan-Sponsored Terrorism, Judicial Review and the Political Question Doctrine*, 18 MD. J. INT'L L. 35 (1994).

[160] *Advisory Opinion on Certain Expenses of the United Nations, ICJ Reports 1962, §168; Namibia case*, *supra* note 156, §45; *Questions of Interpretation and Application of the 1971 Montreal Convention arising from the Aerial Incident at Lockerbie,* Libyan Arab Jamahiriya v. United States of America & United Kingdom, Preliminary Objections, ICJ Reports 1998, Dissenting Opinion President Schwebel, at 164-167.

[161] MOHAMED SAMEH AMR, THE ROLE OF THE INTERNATIONAL COURT OF JUSTICE AS THE PRINCIPAL JUDICIAL ORGAN OF THE UNITED NATIONS 331 (Martinus Nijhoff 2003); JOEL RIDEAU, JURIDICTIONS INTERNATIONALES ET CONTROLE DU RESPECT DE TRAITES CONSTITUTIFS DES ORGANISATIONS INTERNATIONALES 85-89 (Paris 1969).

[162] ICJ Statute, art. 34, Annexed to the UN Charter.

[163] *Monetary Gold Removed from Rome in 1943*, Italy *v.* France, United Kingdom of Great Britain and Northern Ireland and United States of America, ICJ Reports 1954, at 33; *Nicaragua* case, *supra* note 34, §88; *Frontier Dispute*, Burkina Faso *v.* Republic of Mali, ICJ Reports 1986, at 579; *Land, Island and Maritime Frontier Dispute*, El Salvador *v.* Honduras: Nicaragua Intervening, Application to Intervene, ICJ Reports 1990, §73; *Certain Phosphate Lands in Nauru*, Nauru *v.* Australia, Preliminary Objections, ICJ Reports 1992, §55.

overstepped the boundaries of legality and was adopted on purely political reasons? The European Court of Justice seemed unwilling to refrain from reviewing the legality of Security Council resolutions regarding the infamous black lists for the freezing of assets of persons and entities suspected of or related to terrorism.[164] Notwithstanding the validity of proceeding with such a judicial review, the European Court of Justice is a *forum* open only within the European Union context and, as such, its protective capacities, if any, are *ratione personae* limited. It has been suggested that States affected by unlawful decisions of the Security Council could actually choose to disregard them, as if exercising countermeasures against them.[165] While this option presents some advantages, mainly that there is no regional restriction on recourse, the chaotic situation that would result from the domino effect of a State refusing to comply with an unlawful Chapter VII resolution and the Security Council adopting further measures against it cannot be ignored.

It would thus seem that, with regards to this last issue, States would have to count on one of the two following options. First, that the Security Council will always exhibit the necessary maturity to artfully balance political and legal considerations to avoid adopting unlawful resolutions. Or second, that in a more cynical scenario, one of the permanent members of the Security Council, especially those belonging to the actively emerging spacefaring nations, would veto block such a resolution.

D. The case of peacekeeping operations.

The operations undertaken under Chapter VII should not be mistaken or equated with peacekeeping operations. The latter are actually the result of the practice of the United Nations, and to be more precise, of the Security Council, in application of Article 37 of the UN Charter, which reads as follows:

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[164] European Court of Justice, Yassin Abdullah Kadi and Al Barakaat International Foundation v Council of the European Union and Commission of the European Communities, Joined cases C-402/05 P and C-415/05 P (2008).

[165] ANTONIOS TZANAKOPOULOS, DISOBEYING THE SECURITY COUNCIL: COUNTERMEASURES AGAINST WRONGFUL SANCTIONS 157-190 (Oxford 2011).

> 1. Should the parties to a dispute of the nature referred to in Article 33 fail to settle it by the means indicated in that Article, they shall refer it to the Security Council.
>
> 2. If the Security Council deems that the continuance of the dispute is in fact likely to endanger the maintenance of international peace and security, it shall decide whether to take action under Article 36 or to recommend such terms of settlement as it may consider appropriate.[166]

In the majority of the situations referred to it under Article 37, the Security Council chose to recommend the creation of a peacekeeping mission, as the appropriate means to settle an interstate dispute. It is precisely this fact that presents a paradox in the operation of the Security Council: while Article 37 only makes reference to "recommendations," the Security Council has always preferred to establish the peacekeeping missions using its authority under Chapter VII, so as to vest its decision with enforceability. This is probably the reason why, although the term "peacekeeping" or "peacekeeper" is nowhere to be found within the UN Charter, international law academics tend to refer to the so called "Chapter VI and a half," terminology established by the second UN Secretary General, Mr. Dag Hammarskjöld.[167]

Unlike the international military force envisioned in Chapter VII of the Charter, which however never came to be, peacekeeping forces are assembled by units voluntarily contributed by the Member States.[168] In UN peacekeeping operations, the Organisation bears international responsibility for the forces acting on its behalf,[169] unless the contributing States maintain control over

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[166] U.N. Charter art. 37.

[167] Foreign Affairs and International Trade Canada, *What Peacekeeping does*, www.international.gc.ca/peace-paix/keeping-maintien.aspx?lang=en&view=d (last visited Nov. 10, 2014).

[168] Marten Zwanenburg, *International Military Forces*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §8, www.mpepil.com (last visited Nov. 10, 2014).

[169] ECHR: Behrami v. France, Saramati v. France, Germany & Norway, 2/5/2007, §§14,141; Kasumaj v. Greece, 5/8/2007, §3; Galić v. Germany, 28/8/2007, §6; Williams v. The Shipping Corporation of India, US District Court, Eastern District Virginia, 63 ILR (1980), at 368; Jean-Marc Sorel, *La responsabilité des Nations Unies dans les operations de maintien de la paix*, 3 INTERNATIONAL LAW FORUM DU DROIT INTERNATIONAL 130 (2001); Daphna Shraga, *Military Occupation and UN Transitional Administrations – the Analogy and its Limitation*, *in* PROMOTING JUSTICE, HUMAN RIGHTS AND

their contingences,[170] in which case they also maintain responsibility thereof.[171] Keeping that in mind, it is necessary to examine whether it is permissible for the peacekeeping forces to use satellites or satellite-related technology for the successful completion of their mission.

Peacekeeping operations[172] are, by definition, non-aggressive. In fact, peacekeepers only have the right to self-defence, which is however different than the one included in Article 51 of the UN Charter or the individual right of personal self-defence. The original interpretation provided by the UN itself as to what that right signifies was that peacekeepers "may never take the initiative in the use of armed force, but are entitled to respond with force to an attack with arms, including attempts to use force to make them withdraw from positions which they occupy under orders from the commander."[173] Although this definition is now loosened, and peacekeeping forces can forcefully prevent attempts to disrupt their mission, they are nevertheless reluctant to do so, not only so as not to sacrifice their impartiality, but also because of a rather often lack of proper equipment.[174]

As previously mentioned, peacekeeping operations are established under a relevant Security Council resolution, which also provides their mandate. This mandate is further complemented by

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CONFLICT RESOLUTION THROUGH INTERNATIONAL LAW, LIBER AMICORUM LUCIUS CAFLISCH 487 (Martinus Nijhoff 2007).

[170] Jean-Pierre Ritter, *La protection diplomatique à l'égard d'une organisation internationale*, 8 ANNUAIRE FRANÇAISE DE DROIT INT'L 427 (1962); Borhan Amrallah, *The International Responsibility of the United Nations for Activities Carried Out by UN Peace-Keeping Forces*, 32 REVUE EGYPTIENNE DE DROIT INT'L 62, 62-63 & 73-79 (1976); Ewa Butkiewicz, *The Premises of International Responsibility of Inter-Governmental Organizations*, 11 POL. Y.B. INT'L L. 117, 123-125 & 134-135 (1981-1982).

[171] ASR, *supra* note 50, art. 8; *Advisory Opinion on the Difference Relating to Immunity from Legal Process of a Special Rapporteur of the Commission on Human Rights*, ICJ Reports 1999, §66; *Nicaragua* case, *supra* note 34; R. SIMMONDS, LEGAL PROBLEMS ARISING FROM THE UNITED NATIONS MILITARY OPERATIONS 229 (Martinus Nijhoff 1968); Manuel Perez-Gonzalez, *Les organisations internationales et le droit de la responsabilité*, 99 REVUE GENERAL DE DROIT INT'L PUB. 63 (1988).

[172] Michael Bothe, *Peacekeeping*, *in* BRUNO SIMMA, THE CHARTER OF THE UNITED NATIONS, A COMMENTARY 686-688 (2nd ed., Oxford 2002).

[173] Zwanenburg, *supra* note 168, §22.

[174] HITOSHI NASU, INTERNATIONAL LAW ON PEACEKEEPING: A STUDY OF ARTICLE 40 OF THE UN CHARTER 25-27 (Brill 2009).

the signing of a Status of Forces Agreement (SOFA)[175] between the UN (or the regional organisation acting under Security Council authorisation, as explained above) and the host State, which must give its consent for the deployment of troops in its territory.[176] The need to sign a SOFA is even greater than in the cases of friendly forces from a third State being present in the host State's territory following invitation. A SOFA will define the privileges and immunities of the peacekeeping force, clarify issues related to the preservation of command authority, the guaranteeing of fair treatment of individual service members, the conservation of scarce resources etc, and fill in the void created by the lack of customary law applicable to this relationship of organisation and host State, since the phenomenon of the truly international armed force is a novel one.[177] The mandate given by the Security Council would, thus, be considered the *ius ad praesentiam* for the peacekeeping force, while the subsequent and complimentary SOFA would play the role of the *ius in praesentia*.[178]

The question at hand is whether satellites or satellite-related technology and/or infrastructure can be utilised for the support of a peacekeeping mission, and if so, which aspects thereof. It has already been mentioned that, in most peacekeeping operations, the *casques-blues* have at their disposal just the basic equipment to allow them to act in self-defence. The use of cutting-edge arsenal, as might be the case with interventions authorised under Chapter VII, is not really an option during peacekeeping operations. But in any event, if one is ready to accept the use of such weapons or weapon systems as lawful during the course of a Chapter VII intervention, which is a situation of significant gravity, then one should be equally ready to make the same concession for peacekeeping operations, which are both non-aggressive and performed with the hosting States consent. Remote sensing systems used for positioning definition or even the GPS, a platform

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[175] U.N. Secretary General, *Model Status-of-Forces Agreement for Peace-Keeping Operations: Report of the Secretary-General*, U.N. Doc. A/45/594 (Oct. 9, 1990).

[176] Bothe, *supra* note 172, at 690-692.

[177] Jochen Herbst, *Host State Agreements*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §16, www.mpepil.com (last visited Nov. 10, 2014).

[178] Paul J. Conderman, *Status of Armed Forces on Foreign Territory Agreements*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §33, www.mpepil.com (last visited Nov. 10, 2014).

developed from the start as a military application with only limited civilian access,[179] or satellites of the contributing States used for military communications should be deemed as permissible uses of space assets for peacekeeping reasons.

With regards to communications, a point that should be clarified is that of the radio-frequencies used by the peacekeeping force. According to Article 48 of the ITU Constitution, military radio installations fall outside the regulatory scope of the ITU. However, the military is obligated to comply with the regulations when providing non-military services and to not interfere with civilian authorised and protected uses. It is rather often that peacekeeping forces stationed in a host territory will set up a radio station to transmit the UN radio program to the local population, in an effort to establish "a culture of peace."[180] Such activities must always be carried in accordance with the rules of the SOFA, which should include provisions regulating the use of frequencies and the granting of consent of the host State for the operation of such a radio station. If such provisions do not exist, then the peacekeeping forces should request the authorisation of the host State, on the basis of its national frequency regulation, taking into account the international or regional radio regulations of the ITU. Not doing so, would be an unlawful action, which could even be equated to an interference to the internal affairs of a State contrary to article 2§7 of the UN Charter, triggering the international responsibility of the organisation.[181]

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[179] Paul B. Larsen, *Issues Relating to Civilian and Military Uses of GNSS*, 17 SPACE POL'Y 111 (2001); Paul B. Larsen, *Global Navigation Satellite Systems: Universal Technology under Divisive Legal Regimes*, 27 ANNALS AIR & SPACE L. 387, 395 (2002).

[180] G.A. Res. 53/243, U.N. Doc. A/RES/53/243 (Oct. 6, 1999); G.A. Res. 53/25, U.N. Doc. A/RES/53/25 (Nov. 19, 1998); G.A. Res. 56/5, U.N. Doc. A/RES/56/5 (Nov. 13, 2001); G.A. Res. 57/6, U.N. Doc. A/RES/57/6 (Nov. 27, 2002); G.A. Res. 59/143, U.N. Doc. A/RES/59/143 (Feb. 25, 2005).

[181] Int'l Law Comm'n, 63rd Sess., Apr. 26–June 3, July 4–Aug. 12, 2011, U.N. Doc. A/CN.4/L.778 (May 30, 2011) [hereinafter DARIO]; ILA, *Report of the Committee on the Accountability of International Organizations*, Berlin Conference (2004), http://www.ila-hq.org/en/committees/index.cfm/cid/9).

E. Issues of responsibility and/or liability relating to use of force.

Despite the instances and conditions under which force can be lawfully used in, from, towards or through Outer Space analysed in the four titles just above, it is still possible that situations triggering the international responsibility and/or liability of States or of international organisation might take place. A State might actually use disproportionate or unnecessary force while exercising its right to self-defence or while acting under Security Council authorisation: it might actually choose to destroy an enemy satellite instead of following other indicated methods of neutralisation. Such a choice would be a breach of international law, bringing about the application of a secondary set of rules, those relating to the international responsibility and/or liability of the State. The situation with regards to space is even more complex, since the space treaties themselves include provisions relating to the responsibility of States for their activities in space, which should be applied first in such a scenario, as the *lex specialis*.

In general, depending on the performed actions, there are two corresponding types of responsibility and/or liability. If the State has performed commercial activities, *i.e. acta iure gestionis*, and in the process of them has somehow breached a legal obligation, then the State or international organisation is primarily liable in a civil/tort context.[182] However, if the State or international organisation has breached its international obligations while performing *acta iure imperii*, or in other words sovereign acts, then it faces issues of international responsibility and potentially of liability too.[183] The difference between these two types of actions and of corresponding responsibility and/or liability is the existence of jurisdictional immunity for the latter type.[184] States can be brought before domestic foreign courts for violations relating to *acta iure gestionis*, as in those situations they act as a private entity. On the contrary, domestic court jurisdiction is barred when it

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[182] Juliane Kokott, *Sovereign Equality of States*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §36, www.mpepil.com (last visited Nov. 10, 2014).

[183] *Id.*

[184] HAZEL FOX, THE LAW OF STATE IMMUNITY (Oxford 2008).

comes to the adjudication of *acta iure imperii*:[185] this is because States enjoy sovereign immunity over said actions, as a result of the *par in parem non habet imperium / iudicium* doctrine, most commonly known as sovereign equality.[186]

It is obvious that actions relating to the use of force are actions undertaken under the exercise of sovereign powers of the State. It becomes, therefore, necessary to examine issues of international responsibility and/or liability for States acting in breach of the afore-analysed prerequisites for lawful use of force with regards to Outer Space.

Article VI of the OST recognises the international responsibility of States for national activities in outer space, whether by governmental or non-governmental entities. It is clear that defensive manoeuvres or actions taking place in outer space are national activities of a State, as they constitute a prominent manifestation of governmental authority. Article VI of the OST further imposes upon the States the obligation to carry out their national activities in conformity with the provisions set in the OST. This obligation solidifies the duty of States to act in accordance with general international law with regards to the use of force, as analysed above, as it in fact re-emphasises the obligations created, *inter alia*, by Article III of the OST. It also creates a link with Article IX of the OST, which creates a duty of "due regard to the corresponding interests of all other State Parties to the Treaty." The same Article also provides for the request of international consultations, if a State believes that activities planned by another State will cause harmful interference to its rights and rights of third States under the Treaty.[187] Since the possibility of States actually consulting one another before engaging in defensive, even if unlawful for reasons described above, moves is rather slim, States are actually left with the due regard duty. Hence, a State that chooses to use an ASAT weapon against an enemy satellite will be hard pressed to show that it was actually acting with due regard

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[185] *Jurisdictional Immunities of the State*, Germany *v.* Italy: Greece Intervening, ICJ Reports 2012, §§77-78.

[186] Christian Tomuschat, *International Law: Ensuring the Survival of Mankind on the Eve of a New Century: General Course on Public International Law*, 281 R.C.A.D.I. 13, 179 (2001); Jean-Flavien Lalive, *L'immunité de juridiction des états et des organisations internationals*, 84 R.C.A.D.I. 205 (1953).

[187] *See* OST, *supra* note 1, art. 9.

for the corresponding interests of other States for the peaceful enjoyment of outer space, since its action will cause the creation of an orbiting, hazardous cloud of debris, threatening the space assets of numerous different States, and not just those of the enemy.

The issue becomes even more complicated, when liability considerations are taken into account. For under the OST, States are internationally liable for the damage caused by objects they launch, or procure the launch of, to space objects of third States in outer Space, among others.[188] This provision was further clarified by the provisions of the Convention on the International Liability for Damage Caused by Space Objects.[189] Throughout the Liability Convention, the term used is "space object." Article I.(d) of the Convention defines the term "space object" as including component parts of a space object as well as its launch vehicle and parts thereof. This circular definition only refers to objects that can actually be put into orbit in outer space and their launch vehicles and parts thereof, as explained by space law scholars interpreting different provisions of the space treaties.[190] Ballistic missiles or other ASAT weapons do not actually orbit in outer space: they fly through space, perhaps in a sub-orbital manner depending on their target, up until the moment of collision. And indeed, how could a laser beam, such as the ones to be used in Direct Energy Weapon systems,[191] be considered an object, when it is not even tangible? If that is the case, and ASAT weapons cannot actually be considered as space objects, and indeed they are not, then the Liability Convention as a whole is rendered inapplicable with regards thereof. Would States then not be liable for the consequences of using an ASAT weapon at all?

One option would be to suggest that regardless of the Liability Convention, the liability provision included in Article VII of the

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[188] *Id.* art. 7.

[189] Convention on the International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[190] *See* OST, *supra* note 1, art. 4; Moon Agreement, *supra* note 4, art. 3,§2 & 12,§1; Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, T.I.A.S. 8480, 1023 U.N.T.S. 15 [hereinafter Registration Convention]; Stephan Hobe, *Spacecraft, Satellites and Space Objects*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §1, www.mpepil.com (last visited Nov. 10, 2014).

[191] *See* Part II infra.

OST would still be in effect. Indeed, this provision makes reference to "objects" in general, and as long as a warhead of some kind is carried upon a ballistic missile targeting a satellite, then that could be an object launched into space. While this approach could look valid, there are two significant problems: first, if such an interpretation were to be followed, then this would create a loophole for States to develop and use such military technologies that would not qualify as objects, establishing thus conditions of *de facto* immunity and impunity. And second, the combination of the customary rules of interpretation *lex posterior specialis derogat lege priori generali* (i.e. the new and specialised rule overturns the old and general one)[192] does not allow for such an interpretation despite the rules established in the Liability Convention.

It would, therefore, seem as though there is an impasse regarding the international liability of States resulting from the use of ASAT technology. The solution is provided once again, through the application of Article III of the OST, which brings rules of general public international law to the forefront. Where the provisions contained in the space treaties are insufficient or inapplicable to the situation at hand, this fall back provision allows for the application of general public international law.[193] And relating to issues of responsibility and/or liability one would only have to look into the codification of relevant rules by the International Law Commission in the form of the Articles on State Responsibility.[194]

Since the use of an ASAT weapon by the armed forces of a State against an enemy satellite, instead of the use of other available neutralisation means and methods, would constitute a breach of a series of Articles of the OST and of general public international law (necessity, proportionality, abuse of right etc), the State acting unlawfully would be internationally responsible under Articles 1, 2 and 4 of the ASR. The consequence of said responsibility is that the wrong-doing State would have to make reparations[195] to the affected by its unlawful conduct State. Indeed, the unlawful destruction of a satellite infringes the customarily protected prop-

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[192] VCLT, *supra* note 99, arts. 30,§3 & 31,§3(a).

[193] MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW-MAKING 15 (Sijthoff, Leiden 1972).

[194] ASR, *supra* note 50.

[195] *Id.* art. 31.

erty rights[196] over said satellite, of either the State itself or of its nationals. In fact, it has been considered as customary law that the responsible State is under "the obligation to restore the undertaking and, if this be not possible, to pay its value at the time of the indemnification."[197] It is highly unlikely that the wrong-doing State would actually choose to replace the wrongfully destroyed enemy satellite as a form of restitution,[198] if ever this was a possibility. The only option therefore available to the injured State would be to demand[199] compensation[200] for the loss of its space asset. In accordance with international jurisprudence, "[i]t is a well-established rule of international law that an injured State is entitled to obtain compensation from the State which has committed an internationally wrongful act for the damage caused by it."[201] The purpose of the provided compensation is to rectify the wrong suffered, to make the injured State "whole again."[202] International jurisprudence in a large range of cases has determined that the sum owed to the injured party should be "corresponding to the value which a restitution in kind would bear."[203] The loss of a satellite is financially assessable,[204] and equals that of its value (possibly degraded due to use) and, in the case of commercial satellites used for both civilian and military purposes, the anticipated

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[196] Case Concerning Certain German Interests in Polish Upper Silesia, Germany *v.* Poland, PCIJ Series A No. 7 (1926), p. 32; *The Oscar Chinn case*, United Kingdom of Great Britain and Northern Ireland *v.* Belgium, PCIJ Series A/B No. 63 (1934), at 82-84.

[197] Case concerning Factory at Chorzów, Germany *v.* Poland, Merits, 1928, PCIJ Series A No. 17, at 48.

[198] ASR, *supra* note 50, art. 35.

[199] Walter Fletcher Smith case, II UNRIAA (1929), 915, at 918; Government of Kuwait v. American Independent Oil Company, 66 *ILR* 1982, 529, at 533.

[200] ASR, *supra* note 50, art. 36.

[201] *Gabčíkovo-Nagymaros* case, *supra* note 64, §152; *Chorzów Factory* case, *supra* note 197, at 27.

[202] The Lusitania case (USA v. Germany), VII UNRIAA (1923), 32, at 39.

[203] The M/V Saiga (No. 2) (Saint Vincent and the Grenadines v. Guinea), ITLOS judgment of 1 July 1999, §170; Papamichalopoulos v. Greece, ECHR, Series A, No. 330-B (1995), §36; Velásquez Rodríguez, Inter-Am.Ct.H.R., Series C, No. 4 (1989), at 26-27, 30-31; Tippetts, Abbett, McCarthy, Stratton v. TAMS-AFFA Consulting Engineers of Iran and Others, 6 Iran-U.S.C.T.R. 1984, at 225.

[204] Stephan Wittich, *Compensation*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §25, www.mpepil.com (last visited Nov. 10, 2014).

gain[205] from an unhindered operation, thus entitling the injured State to lost profits[206] claims.

It should be noted, at this point, that since under Article VI of the OST all activities in space are national State activities, the injured State could bring forth all of the above claims, even on behalf of its nationals, by substitution without actually having to follow the traditional path of diplomatic protection. Indeed, as the ICJ[207] and PCIJ[208] have held, injury of a national is harm to the State itself, generating a *parens patriae* right of the State.

The next issue, which needs to be addressed, is clarifying the responsibility and/or liability situation when a State is acting wrongfully not of its own accord, but while acting under the authorisation of an international organization, in the case of use of force, the Security Council or a regional defensive organization upon which the Security Council delegated relevant jurisdiction. Such an authorisation to use force would actually be an exercise of the "sovereign powers" of the organization.[209] Under modern international law, immunity is also granted to international organisations,[210] under the context of functional necessity.[211] This, however, does not mean that an international organisation cannot be held responsible, should it violate international law. It only signi-

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[205] Robert May case (USA v. Guatemala), 1900 Foreign Relations, 648; Amco Asia Co v Republic of Indonesia (Resubmitted Case: Award of 31 May 1990), ICSID Case No ARB/81/1, §178; Sapphire International Petroleum Ltd v. National Iranian Oil Company, 35 ILR 1963, 136; Libyan American Oil Company (LIAMCO) v. Government of the Libyan Arab Republic, 62 ILR 1977, 140.

[206] The Cape Horn Pigeon Case (USA v. Russia), IX UNRIAA (1902), 63; The Yuille Shortridge and Co. case (Great Britain v. Portugal), de Lapradelle & Politis (arbitrators), II Recueil des arbitrages internationaux (1861), 78.

[207] Nottebohm case, Liechtenstein v. Guatemala, ICJ Reports 1955, §4; Interhandel case, Switzerland v. United States of America, Jurisdiction, ICJ Reports 1959, §27.

[208] Mavrommatis Palestine Concessions case, Greece v. United Kingdom of Great Britain and Northern Ireland, PCIJ Series A No. 2 (1924), §12; Panevezys-Saldutiskis Railway Co. case, Estonia v. Lithuania, PCIJ Series A/B No. 76 (1939), §18.

[209] DAN SAROOSHI, INTERNATIONAL ORGANIZATIONS AND THEIR EXERCISE OF SOVEREIGN POWERS 64 (Oxford 2005).

[210] Christian Dominicé, *L'immunité de juridiction et d'exécution des organisations internationales*, 187 R.C.A.D.I. 145 (1984).

[211] Chanaka Wickremasinghe, *International Organisations or Institutions, Immunities before National Courts*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, §§14-23, www.mpepil.com (last visited Nov. 10, 2014); Antonio. Cassese, *L'immunité de juridiction civile des organisations internationales dans la jurisprudence italienne*, 30 ANNUAIRE FRANÇAISE DE DROIT INT'L 556 (1984).

fies that the organisation cannot be prosecuted before the domestic courts of the injured State, unless the organisation itself chooses to waive its immunity. Since international organisations do not have *locus standi* before the ICJ,[212] an *ad hoc* arbitral tribunal is most often the preferred option for adjudicating such cases.

The same complications as the ones in the case of independent State action, in relation to responsibility and/or liability under the space treaties, appear in the case of international organisation actions as well. Article VI of the OST demands that "responsibility for compliance with this Treaty shall be borne both by the international organisation and by the States Parties to the Treaty participating in such organisation." Article XII of the OST further clarifies that "the provisions of this Treaty shall apply to the activities […] carried on within the framework of international intergovernmental organisations." The second paragraph of the same Article obligates States to resolve their disputes "either with the appropriate international organisation or with one or more States members of that international organisation, which are Parties to this Treaty."[213] The exact same argumentation as the one presented above relating to the use of ASAT weapons and the liability of the State, can be *mutatis mutandis* used in the case of international organisations. The fall back provision of Article III of the OST would have to be activated again, this time however pointing towards a different codification of international rules: the ILC's Draft Articles on the Responsibility of International Organisations.[214]

Articles 1, 3 and 4 of DARIO provide the conditions for the existence of international responsibility of an international organisation. There must be some kind of conduct, which is unlawful under international law and can be attributable to the international organisation. For attribution to the organisation, all that is necessary is that the conduct is performed by an organ of the organisation,[215] or by a State or entity at its disposal.[216] The destruction of a satellite by a State or States acting on behalf of the

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[212] ICJ Statute, art. 34,§1, annexed to the UN Charter.
[213] *See* OST, *supra* note 1, art. 13 §2.
[214] *Supra* note 180.
[215] DARIO, *supra* note 181, art. 6.
[216] *Id.* art. 7.

organisation following a relevant mandate, in violation of the rules of necessity and proportionality, can be considered action in excess of authority or contravention of instruction, which, nevertheless, would still engage the international responsibility of the organisation.[217] The consequence of a wrongful act of an international organisation would be its obligation to make reparations to the injured State.[218] Once again, for the same reasons as the aforementioned, compensation[219] would be preferred over restitution,[220] the relevant justification and legal basis being unaltered.

There is one last point which needs to be discussed before moving on to the next part of this Article. It is none other than the question of who takes responsibility by the damage caused by a piece of space debris created from the unlawful use of force in space, as analysed above, to a space object in space or other property of a third Party not in space, in application of the "pinball effect." If the piece can be recognised as belonging to the ASAT weapon that hit the originally targeted satellite or space object, then it would be clear that either the State or the international organisation on behalf of which the weapon was launched would be responsible and/or liable for the damage, according to the aforementioned rules of responsibility and/or liability. But if the piece belongs to the targeted space object, then the situation is completely different. For one, the provisions of the Liability Convention could be applied, since in this scenario a component part of a space object of the injured State causes damage to the space object of another State, or the property of another State not in space. Article III of the Liability Convention establishes fault liability for damage caused in space, while Article II establishes absolute liability for damage caused anywhere but in space. It would seem that, if the damage is caused in space, the original injured State could prove that it is not at fault for the creation of the piece of space debris and not be liable for the damage. But in the case of Article II of the Liability Convention, the only possible way for the original injured State to avoid liability, would be to claim *force*

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[217] *Id.* art. 8.
[218] *Id.* art. 31.
[219] *Id.* art. 36.
[220] *Id.* art. 35.

majeure as a condition precluding the wrongfulness[221] of its involuntary action of causing damage to a third State.

PART II: CONTEMPORARY PERSPECTIVES AND NEW APPROACHES TO THE MILITARISATION OF OUTER SPACE.

Part I of this Article focused on analysing the current legal regime with regards to the correlation of use of force under public international law in general and peaceful uses of outer space under space law in particular. By examining the rules applicable under each circumstance relating to the use of satellite or space technology in general for military purposes, the framework of lawfulness was drawn, as it stands with the current legal regime.

Part II of this Article will examine instances of State practice, either nascent, recent or already dated, which have somehow challenged the legal *status quo* and either served as obstacles or as inspiration for the development of law of outer space. These challenges graphically depict the contemporary perspectives of States, scholars and academics as to what constitutes a "peaceful" use of space, its protection and the overall movement of the international community pendulum towards the issue of militarisation and weaponisation of outer space.

A. Challenging the current regime: the recent ASAT tests.

On 11 January 2007, China launched a ballistic missile targeting its almost defunct Feng-Yun 1-C weather satellite, achieving collision in space and the destruction of the satellite.[222] The conducted operation was, in fact, an Anti-Satellite (ASAT) test that surprised the unsuspecting international space community and caused a plethora of reactions,[223] not only because of the cloud of orbiting space debris created by the collision, but also because of the dawn of a new age in space relations.[224] A relatively newly-

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[221] ASR, *supra* note 50, art. 23.

[222] William. J. Broad & David E. Sanger, *Flexing Muscle, China Destroys Satellite in Test*, N.Y. TIMES, Jan. 19, 2007, at A1.

[223] David E. Sanger & Joseph Kahn, *U.S. Tries to Interpret China's Silence Over Test*, N.Y. TIMES, Jan. 22, 2007, at A3; Joseph Kahn, A New Player at Star Wars: China Shows Assertiveness In Reported Weapons Test, N.Y. TIMES, Jan. 20, 2007, at A7.

[224] K. K. Nair, China's ASAT Test: A Demonstrated Need for Legal Reform, 33 J. SPACE L. 191, 191 (2007).

emerging space-faring nation demonstrated in the most explicit way possible that it possessed the capability to target orbiting satellites, whether functional or not. The agitation experienced by the international community on the face of this potential threat towards the space assets of different States was unprecedented since the discontinuation of the US and Soviet ASAT programmes in the 1980s.[225]

Just little over a year after the Chinese test, on 20 February 2008, the USA also performed an ASAT test. Codenamed "*Operation Burning Frost*," the USA mission targeted a non-functional American reconnaissance satellite, which was quickly losing altitude and threatened to re-enter the Earth's atmosphere and crash, while still carrying significant amounts of the highly toxic hydrazine fuel.[226] The USA Navy used an SM-3 anti-ballistic missile to hit the falling satellite, a weapon that cannot yet reach satellites in Low Earth Orbit, but which can still be upgraded to do so. The international community once again reacted vividly to this development, for it was understood that the test was not only aimed at safeguarding the public's health from a possible hydrazine exposure, but also to send a clear message to China, and possibly other States too, with regards to the American capacities.[227] A point of particular interest though is that, despite the protests of various States, no State made any direct reference to the illegality of such tests, preferring to use broader negative terms, but certainly not the characterisation "illegal."[228] It was only Japan that once used this specific terminology with regards to the 2007 Chinese ASAT test.[229]

This new escalation of events in the field of space weaponisation is considered to lead to a reinvigorated arms race in space. The prospect of trying to secure peace and safety in space by the

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[225] Allan S. Krass, *Verification: How much is enough?* 103 (Stockholm International Peace Research Institute 1985).

[226] Jamie McIntyre, et al., *Navy Missile Hits Dying Spy Satellite, Says Pentagon*, CNN, Feb. 21, 2008, http://www.cnn.com/2008/TECH/space/02/20/satellite.shootdown/.

[227] *US Spy Satellite Plan "A Cover"*, BBC NEWS, Feb. 17, 2008, http://news.bbc.co.uk; Kristin Roberts, Pentagon Plans to Shoot Down Disabled Satellite, REUTERS, Feb. 14, 2008, http://www.reuters.com/article/2008/02/14/us-usa-satellite-missile-idUSN1447206620080214.

[228] David A. Koplow, *ASAT-isfaction: Customary International Law and the Regulation of Anti-Satellite Weapons,* 30 MICH. J. INT'L L. 1187, 1237 (2008-2009).

[229] *Id.* at 1241.

increase of ASAT weapons of all parties concerned, almost in a way of mutual check and balance, as was the case with nuclear weapons during the Cold War Era,[230] is not really considered attractive by the international community. Instead, suggestions have been made for the negotiation and signing of a comprehensive ASAT Ban treaty, as the only reasonable and fail-safe way to protect the space assets of various States.[231] However, the ongoing development and testing of ASAT weapons, whether Kinetic Energy ASAT (KEASAT) or Direct Energy Weapons (DEW), by a series of States does not provide a favourable background for the adoption of such an instrument.[232]

The fundamental problem with the conducted ASAT tests is that they increase dramatically the number of orbiting space debris, thus endangering the space assets of other States, especially with the "pinball effect" they set in motion from a future collision of said debris amongst itself or with other satellites.[233] In fact, a potential collision between a piece of debris created by an ASAT test and a third party's satellite could very well violate the *ius ad bellum* and the *ius in bello*, especially if the satellite hit by the debris is of civilian use. And although it is arguable that most civilian satellites can be potentially used for military applications too, it remains a fact that those used for purely civilian applications, such as those for exclusively scientific research, should never be targeted.[234]

B. Ballistic missiles and other ("smart") weapons.

Being the means to an end, arms control treaties aim at a peaceful international environment through the reduction of potential conflicts and the management of threats to international

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[230] Herbert F. York, *Nuclear Deterrence and the Military Uses of Space*, *in* F. LONG, D. HAFNER & J. BOUTWELL (EDS.), WEAPONS IN SPACE 17-32 (1986).

[231] *See* Frank M. Walsch, *Forging a Diplomatic Shield for American Satellites: The Case for Re-evaluating the 2006 National Space Policy in Light of a Chinese Anti-Satellite System*, 72 J. AIR L. & COM. 759 (2007).

[232] Bhupendra Jasani, *Military Use of Outer Space*, 27 ANNALS AIR & SPACE L. 347, 357 (2002).

[233] Henry T. Scott, *Improving the Shield: Mitigating the Danger of Space Debris by Enforcing and Developing Already Existing Space Law*, 34 ANNALS AIR & SPACE L. 713, 728 (2009).

[234] Brandon L. Hart, *Anti-Satellite Weapons: Threats, Laws and the Uncertain Future of Space*, 33 ANNALS AIR & SPACE L. 344, 362 (2008).

peace and security resulting from over-weaponisation.[235] One of the most significant arms control instruments is the 1972 Treaty on Anti-Ballistic Missile Systems[236] negotiated between USA and USSR. The fundamental idea behind the adoption of the ABM Treaty was that "security is enhanced and the stability of the strategic balance strengthened if both sides in the Cold War forswear defensive systems [under] a widely accepted doctrine of nuclear deterrence."[237] By limiting the development and deployment of ABM systems a reduction of the raise in offensive arms could be achieved. Thus, the ABM Treaty imposed an obligation on both the contracting States "not to develop, test or deploy ABM systems or components which are sea-based, air-based, space-based or mobile land-based."[238] The Treaty basically outlawed not only the placement of ABM systems in outer space, but also the development and testing of such systems *ab initio*.[239] With the exception on only one limited system being allowed per contracting Party near its capital city and one to protect an Intercontinental Ballistic Missile (ICBM) launch area, both of which had to be at least 1300 kilometres apart so as not to create an effective regional defence zone or the beginning of a worldwide system,[240] the whole Treaty was constructed on a Mutual Assured Destruction system philosophy. Article VI of the ABM Treaty imposed a fairly comprehensive prohibition of enhancement of capabilities of the existing ABM systems, of their testing in ABM mode and the deployment of radars for early warning of strategic ballistic missile attack other than along the periphery of the national territory of the State and oriented outwards.[241]

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[235] Michel Bourbonnière, *Legal Regime for Keeping Outer Space Free of Armaments: Prospects?*, 27 ANNALS AIR & SPACE L. 109, 110 (2002).

[236] 1972 Treaty on Anti-Ballistic Missile Systems, 23 U.S.T 3435, T.I.A.S. 7503 [hereinafter ABM Treaty]; Complemented by the 1972 Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms, 23 U.S.T. 3463, T.I.A.S. 7504 [hereinafter SALT-I].

[237] Jankowitsch, *supra* note 21, at 104.

[238] ABM Treaty, *supra* note 236, art. V,§1.

[239] Sune Danielsson, *Examination of Proposals Relating to the Prevention of an Arms Race in Outer Space*, 12-I J. SPACE L. 1, 3 (1984).

[240] ABM Treaty, *supra* note 236, art. III.

[241] Article VI ABM Treaty reads as follows:

> To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by the Treaty, each Party undertakes: (a) not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launch-

Article VIII of the ABM Treaty dictated the destruction of excess numbers of or of prohibited under the Treaty ABM systems and their components, or of ABM Systems and their components outside the territory of the States, under agreed procedures as soon as possible.[242]

According to the rule contained in Article IX of the ABM Treaty, the Parties were under the obligation "not to transfer to other States, and not to deploy outside [their] national territory, ABM systems or their components limited by the Treaty." There were certain worries that this provision would actually be an obstacle to the potential retirement of ABM radars and equipment for civilian use, if ever the use of ABM systems for their primary cause became obsolete.[243]

Article XII was a ground-breaking provision, recognising for the first time the role of national technical means of verification. An extensive analysis of the importance of verification for the purpose of maintaining outer space peaceful is to be found under title (E) of the present part of this Article. Suffice it to mention, for the time being, that the whole verification system envisioned by the ABM Treaty was a mutual confidence building mechanism between the two States, which greatly affected the perception of the international community as to how international peace and security can be guaranteed.

Under Article XV thereof, the AMB Treaty was of unlimited duration. It nevertheless allowed for the withdrawal of a Party in the exercise of its national sovereignty, under the precondition of a determination that extraordinary events related to the subject

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> ers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode; and
>
> (b) not to deploy in the future radars for early warning of strategic ballistic missile attack except at locations along the periphery of its national territory and oriented outward.

Id. art. VI.

[242] Article VIII of the ABM Treaty reads as follows: "ABM systems or their components in excess of the numbers or outside the areas specified in this Treaty, as well as ABM systems or their components prohibited by this Treaty, shall be destroyed or dismantled under agreed procedures within the shortest possible agreed period of time." *Id.* art. VIII.

[243] F. Kenneth Schwetje, *They Shall Beat Their Swords into Plowshares (In Accordance with All Relevant Arms Control Agreements)*, 27-I ANNALS AIR & SPACE L. 383, 391 (1992).

matter of the Treaty have gravely affected its national interests. Such determination and subsequent withdrawal decision was to be notified to the other Party in written form, explaining the reasons for the withdrawal, six months in advance of the desired withdrawal date.[244]

In the mid-1980s in the USA, active discussions were held with regards to the creation of a Strategic Defence Initiative (SDI). This system was basically an ABM system, and the Department of Defence made sincere efforts to broaden the scope of interpretation of the ABM Treaty, so as to render the development of a space-based SDI permissible.[245] The discussions for the development of the programme continued during the Clinton administration, the only difference being that it was portrayed as a national defence system. The plan was not abandoned by the George W. Bush administration either, which followed a narrow interpretation of the ABM Treaty. Recognising that the development of the SDI system would violate the provisions of the Treaty, the USA preferred in December 2001 to withdraw from the ABM Treaty citing Article XV thereof, instead of cancelling the programme. The reasons put forth as justification of the "extraordinary events" causing the withdrawal were not immediately explained as required by Article XV, but given the attack on the World Trade Centre earlier in the same year, the argument of self-defence against non-State actors is greatly supported by the reinvigoration and placement on high alert of all relevant sections of the American armed forces.[246] The continuous development of space weapons has led to an equally continuous development, or suggestion for development, of sophisticated defence initiatives, creating, thus, what could be described as a vicious circle of

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[244] The precise wording of Article XII is: "1. This Treaty shall be of unlimited duration. 2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests." ABM Treaty, *supra* note 236, art. XII.

[245] *See* Daniel Goedhuis, *Some Observations on the Attitude of West European Governments to the Development of Defensive Weapons in Outer Space*, 15-II J. SPACE L. 101 (1987).

[246] Wolfgang K. H. Panofsky, *The President's Decision to Withdraw from the ABM Treaty* (March 2002), www.eisenhowerinstitute.org/presscenter/release06-02.htm.

weaponisation. The USA in particular have shown great interest in developing a National Missile Defence programme, to ensure protection from last-minute modified civilian space objects of enemy States targeted against it.[247] Soon after the denunciation of the ABM Treaty negotiations started between the USA and various former Soviet States, for the creation of a ABM system based in Eastern Europe, whose purpose according to the USA is the defence against rogue States located in the Middle East, a position not shared, however, by Russia that sees such a system as a direct threat to its interests in the area.

The denunciation of the ABM Treaty has led to a swift in the subject of the discussion, from the militarisation of outer space to the weaponisation of outer space, with numerous States designing, and as shown above, testing ASAT systems and other space-related weapons. However, this is not the only contemporary challenge the international community is facing.

In May 2011 the US Department of Defence announced that henceforth it would consider all attempts of "cyber-attacks" against its facilities, installations and major contractors as an armed attack against the USA and react accordingly.[248] While not specifically mentioning who the perpetrators of these cyber-attacks were, lots of hints led to the recognition of China as being on the receiving end of the American statement. And indeed, just two days after this announcement, a paper written by two Chinese Military School Professors was published, ascertaining China's position that it would react to any challenge posed and that it was in fact the USA that engaged in a shadow war of hacking and electronic system infiltration.[249] Whatever the truth may be behind both these statements, it is evident that satellite military or military-related systems are in the front line of these cyber-attacks,

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[247] Patrick A. Salin, *Space Law, The U.S. National Missile Defense Initiative and The Common Concern for Global Security*, 27 ANNALS AIR & SPACE L. 535, 542 (2002).

[248] Siobahn Gorman & Julian E. Barnes, *Cyber Combat: Act of War – Pentagon Sets Stage for U.S. to Respond to Computer Sabotage with Military Force*, WALL ST. J., (May 31, 2011, 12:01 AM), http://online.wsj.com/articles/SB10001424052702304563104576355623135782718.

[249] Associated Press & Lambraki Journal Corporation, *Beijing Accuses Washington of a "Shadow Internet War"*, June 3, 2011, www.in.gr [in Greek] (citing a relevant article published in *China Youth Daily* by Professors of the Chinese Military Sciences Academy).

thus causing completely new concerns about international peace and security. It would thus be prudent to briefly address the issue of cyber-attacks against satellites and other space-related systems.

"Cyber-attack" is an attack on or through cyberspace,[250] i.e. the Global Information Infrastructure,[251] and constitutes part of what is commonly known in the armed forces as "informative warfare."[252] Commercial satellites also used for military purposes are considered prime targets for this kind of warfare, since no direct confrontation with a traditional organised army is required, while the results of a successful attack are anything but negligible.[253]

But as already discussed in Part I of the present Article, in order for a State to lawfully exercise its right to self-defence, it must be faced with an armed attack. The question at hand is whether a cyber-attack can be considered as an armed attack, under the *Nicaragua* rationale. It has been suggested that since a cyber-attack against a satellite, if not performed in self-defence or under Security Council authorisation,[254] can effectively incapacitate it,[255] thus infringing the sovereign rights of the launching State.[256] The combination of these three elements suffices for a cyber-attack to be considered an armed attack.[257] If that is the case, for which the present author is highly sceptical, then the following considerations must be taken into account.

First, what is the status of the programmers engaged in hacking enemy systems? The traditional *ius in bello* recognises only two categories of persons: combatants and civilians. As already discussed in Part I of the present Article, combatants must be distinguished from civilians at all times, and military targets must not be concealed among civilian property, so as to respect the

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[250] *The Use of Force in Response to Cyber Attack on Commercial Space Systems*, *supra* note 22, at 1220.

[251] US National Defence Panel, *Transforming Defence: National Security in the 21st Century*, www.dtic.mil/ndp/FullDoc2.pdf.

[252] *The Use of Force in Response to Cyber Attack on Commercial Space Systems*, *supra* note 22, at 1221.

[253] *See* James Adams, *Virtual Defense*, 80 FOREIGN AFF. J. 105 (2001).

[254] G.A. Res. 3314 (XXIX), art. 6, U.N. Doc. A/RES/3314 (Dec. 14, 1975).

[255] *Id.* art. 2.

[256] *Id.* art. 3(b).

[257] *The Use of Force in Response to Cyber Attack on Commercial Space Systems*, *supra* note 22, at 1258.

principle of distinction. Are these requirements met in the case of hacking teams engaging in cyber-attacks against satellite systems of various States under the directions of their State? Little is known as to where the "base" of such persons is located, if they are military or civilian personnel, if they are wearing uniforms and carry visible military insignia, as per the requirements of Article 48 of the First Additional Protocol to the Geneva Conventions. The fact remains that, if we accept that a cyber-attack constitutes an armed attack, then the persons responsible for perpetrating such attack are to be considered combatants, with all the protection and hazards that such a characterisation entails under International Humanitarian Law.

Second, the principles of necessity and proportionality must be taken into consideration when deciding on what action to take against these cyber-attacks. Only the action that is necessary for the defence against the specific attack must be taken. The action must be proportionate to the objective the military seeks to achieve, meaning that it must not create excessive suffering or collateral damage to civilians and other non-military objectives.[258] That being the case, it would seem that an armed response to a cyber-attack would be disproportionate and unnecessary, unless it can be restricted only against the programmers/combatants engaged in the informative warfare and only within the walls of their base, for it is doubtful that their combatant status follows them throughout the day, even after they have left their work station. A more adequate measure would seem to respond to cyber-attacks by cyber-attacks, introducing thus an element of reciprocity in the treatment of the situation and the personnel involved therein. However, even these cyber-attacks must be proportionate. A State cannot order the destruction of the complete network of another State, if that is even possible, in response to a cyber-attack. Actions must remain restricted to the extent of the loss suffered or the injury attempted, at least for as long as international law does not directly address these newly emerging issues.

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[258] *See* Part I for relevant bibliography.

C. Proposals for deweaponisation: the Russian-Chinese Draft PPWT.

Following the completion of the most recent ASAT tests, China and Russia decided to come together and propose a draft for a new space treaty. In March 2008 they proposed a draft treaty, whose title was "Treaty on the Prevention of Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects."[259] In its Preamble the drafters of the PPWT recognise the right of every nation to freely explore and use outer space and by implication that the existence of weapons in space might threat the rights of others. They also note that outer space should be kept as a sphere outside any military confrontation, thus assuring the survival of satellites. Finally, the importance of the commitments achieved through PAROS for the proper use of space by all nations is also recognised. The draft PPWT aims to address and resolve some issues that the two proposing States felt remained unanswered by the current legal regime governing outer space.

The first issue that the PPWT takes note of is the need to have a fixed delimitation of the air space / outer space boundary. Article 1 (a) of the PPWT sets this boundary at approximately 100 km over the ocean level of the Earth. In fact, this suggestion is nothing more than a repetition of an informal agreement reached amongst States, while official discussions on the matter remain open within the COPUOS.

The second very important definition provided by the PPWT is that of "weapons in outer space."[260] The proposed definition includes "any device placed in outer space, based on any physical principle, specially produced or converted to eliminate, damage or disrupt normal function of objects in outer space, on the Earth or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict damage to them."[261] However, a careful reading of this definition will show that the issue of earth-based ASAT weapons is not dealt with at all. If the

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[259] 2008 Draft Treaty on the Prevention of Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects, www.reachingcriticalwill.org/political/cd/papers08/1session/Feb12%20Draft%20PPWT.pdf [hereinafter PPWT].

[260] *Id.* art. 1(c).

[261] *Id.*

purpose of the PPWT is indeed to prevent the use of force in outer space, then ASAT weapons cannot be left outside the regulatory scope of its provisions, as that would create a significant loophole undermining the very philosophy of the treaty from the inside. The truth of the matter is that a fixed and agreed upon definition of what constitutes a space weapon, or for that matter simply a weapon, has not yet been reached, although scholars have made various suggestions and interpretations.[262] Furthermore, "a weapon will be considered as "placed" in outer space if it orbits the Earth at least once, or follows a section of such an orbit before leaving this orbit, or is stationed on a permanent basis somewhere in outer space."[263] This definition also does not cover earth-based ASAT weapons, although one could argue that the clause about following just a section of an orbit might be a hint to that direction.

Last but not least, as far as the definitions go, the PPWT provides a definition for the term "space object," which is admittedly rather obscure under the current legal regime. The proposed definition reads as follows:

> The term "outer space object" means any device, designed for functioning in outer space, being launched into an orbit around any celestial body, or being in the orbit around any celestial body, or on any celestial body except the Earth, or leaving the orbit around any celestial body towards this celestial body, or moving from any celestial body towards another celestial body, or placed in outer space by any other means.[264]

The proposed definition is fairly comprehensive and encompassing of all potential scenarios of the use of a space object. From the definition it is made clear that objects such as ballistic missiles or sounding rockets are not covered by the PPWT, which could, again, be proven detrimental to the purposes of the treaty.

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[262] *See* Theresa Hitchens, *Monsters and Shadows: Left Unchecked American Fears Regarding Threats to Space Assets Will Drive Weaponization*, 5 DISARMAMENT FORUM 15 (2003); Justin McClelland, *The Review of Weapons in Accordance with Article 36 of Additional Protocol I*, 850 INT'L REV. RED CROSS 397, 404 (2003).

[263] PPWT, *supra* note 259, art. 1(d).

[264] *Id.* art. 1(b).

Article II of the PPWT introduces the basic prohibition of placement of weapons in space and of their use or threat of use. In particular, it reads as follows:

> States Parties undertake not to place in orbit around the Earth any objects carrying any kind of weapons, not to install such weapons on celestial bodies, and not to station such weapons in outer space in any other manner; not to resort to the threat or use of force against outer space objects; not to assist or encourage other states, groups of states or international organizations to participate in activities prohibited by the Treaty.[265]

The issue mentioned in the definitions is yet again noted here. The prohibition only includes those weapons that are placed in space, the emphasis being solely put in this domain. No mention is made as to earth-based, sea-based or air-based ASAT weapons, which could still be used by the member States of the treaty, if it were to be adopted. A potential solution to this problem could be given by the provision of Article III of the PPWT, according to which State Parties "shall take all necessary measures to prevent any activity prohibited by the Treaty on its territory or in any other place under its jurisdiction or control."[266] However, this provision too seems problematic, as States can still act from places beyond any national jurisdiction or control, such as the high seas or the international air space. It could be argued that "place" would also include State aircraft and warships found in these locations; however an interpretation according to the ordinary meaning of the word[267] would preclude such an assumption. Additionally, the prohibited use of force is directed only against space objects and not other States in general. This would mean that an attack with an earth-based, fixed or mobile, weapon operating through space against another State would not be covered by the PPWT. Despite this, one should not fail to notice that the prohibition of weapons contained in both Articles II and III encompasses all kinds of weapons, not just nuclear and weapons of mass

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[265] *Id.* art. 2.
[266] *Id.* art. 3.
[267] VCLT, *supra* note 99, art. 33,§1.

destruction, as is the case with the relevant provisions of the Outer Space Treaty and the Moon Agreement.

Articles IV and V act as the fall-back provisions for the application of general public international law alongside those of the PPWT. They respectively read as follows:

> Article IV: Nothing in this Treaty can be interpreted as impeding the rights of the States Parties to explore and use outer space for peaceful purposes in accordance with international law, which include but are not limited to the Charter of the United Nations and the Outer Space Treaty.
>
> Article V: Noting in this Treaty can be construed as impeding the realization by the States Parties of the sovereign right for self-defense in accordance with Article 51 of the Charter of the United Nations.

These provisions seem to be in accordance with the existing legal regime, both of general public international law and of space law in particular. The choice of separation in two articles, one making a general reference to the rights recognised under the Charter and the Outer Space Treaty and one with explicit reference to the right of self-defence, is presumably aimed to clarify any confusion created with the obligation to use outer space for peaceful purposes.

Article VI of the PPWT is perhaps the most poorly drafted article contained in the proposal. It addresses the issue of verification in the following words:

> With a view to facilitate assurance of compliance with the Treaty provisions and to promote transparency and confidence-building in outer space activities the States Parties shall practice on a voluntary basis, unless agreed otherwise, agreed confidence-building measures.
>
> Measures of verification of compliance with the Treaty may be the subject of an additional protocol.[268]

This Article more or less proposes that verification of the spatial activities of the other State Parties to the treaty is done

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[268] PPWT, *supra* note 259, art. 6.

through voluntary measures, after a relevant agreement. The whole mechanism is rather confusing and it obviously leaves a rather wide margin of negotiations for the States to resolve any pertinent issues at a later time, with an additional protocol. To be noted, that such a protocol may, and not shall, be adopted, meaning that the States could very well turn a blind eye on the obligation to agree upon the measures of verification to be voluntarily used under the PPWT.

Last but not least, the draft PPWT envisions the creation of an Executive organisation of the treaty, with, among others, dispute settlement resolution powers. The relevant provisions are included in Articles VII and VIII, the text of which follows:

> Article VII: When a dispute arises between States Parties concerning the application or the interpretation of the provisions of this Treaty, the parties concerned shall first consult together with a view to settling the dispute by negotiation and cooperation.
>
> When the parties concerned do not come to an agreement after consultation, the disputed situation that has arisen may be referred to the Executive organization of the Treaty along with provision of the relevant argumentation.
>
> Each State Party shall undertake to cooperate in the settlement of the disputed situation that has arisen with the Executive organization of the Treaty.
>
> Article VIII: To promote the implementation of the objectives and the provisions of the Treaty, States Parties shall establish the Executive organization of the Treaty which shall:
>
> > a) receive for consideration inquiries by any State Party or a group of States Parties related to the grounds that have arisen to believe that the violation of the Treaty by any State Party is taking place;
> >
> > b) consider matters concerning the compliance with the obligations taken by States Parties;
> >
> > c) organize and conduct consultations with the State Parties with the view to settle down the situation that has

> arisen in connection with the violation of a State Party of the Treaty;
>
> d) take measures to put an end to the violation of the Treaty by any State Party.
>
> The title, status, specific functions and forms of work of the Executive organization of the Treaty shall be the subject of an additional protocol to the Treaty.[269]

The most important issue with regards to the proposed treaty though, it that it provides no solution as to what is to happen to the already existing military satellites in outer space carrying non-prohibited weapons. There is no replacement, mutual destruction or other kind of mechanism in the treaty towards this end. Perhaps if such a provision was included, States that already possess such satellites would refuse from the outset any kind of discussion over this draft. On the contrary, as it currently stands, the draft has caught the attention of numerous States, who have submitted relevant comments with regards to the proposed measures.[270] However, not all major space-faring nations are amenable to the conclusion of such a treaty. The USA in particular oppose any restrictions that might limit its access to or use of space, including any potential arms control agreements, testing or other operations in outer space.[271]

D. Proposals for deweaponisation: the 2010 European Draft Code of Conduct for Outer Space Activities.

The European Union has always been active in the exploration and use of Outer Space, having within its members really active space-faring nations, such as France, Germany, the United Kingdom etc. However, the European Union Member States still maintain a rather high degree of individuality when it comes to their space activities, which has so far not allowed for the creation of a coherent European Space Policy, although it is greatly desired

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[269] *Id.* arts. 7 & 8.

[270] Ram S. Jakhu, *Law of Space Applications, Documents and Materials* 1852-1898 (McGill Institute of Air and Space Law, Montreal 2011).

[271] Paul Stephen Dempsey, *The Evolution of US Space Policy*, 33 ANNALS AIR & SPACE L. 325, 334 (2008); USA National Security Presidential Directive, *National Space Policy 2006*, at 2, *available at* www.ostp.gov.

by everyone.[272] Consequently, despite substantial efforts towards the creation of a common European Space Military, this option has not yet come to be.[273]

The European Union has not remained passive, however, on the face of challenges such as the ones presented above. Like Russia and China, the European Union has presented its own international instrument addressing some of the issues caused by the militarisation of outer space. Unlike Russia and China though, the European Union has opted for a non-binding instrument, and has hence presented a draft Code of Conduct for Outer Space Activities.[274] The draft Code is an attempt to minimize the negative impact of certain activities, to make space more sustainable and indirectly control the militarisation and weaponisation of outer space. It has been agreed upon by the European Union, revised following consultations with other space faring nations and presented to the Conference on Disarmament, as an alternative method of regulating existing issues with regards to space. It reflects the fundamental premise of the European Union for the strengthening the security of activities in outer space in the context of expanding space activities that contribute to the development and security of States.[275] The first purpose of the draft Code is to encourage participation on a voluntary basis in measures for transparency, confidence building etc., not exclusively by the European Union States, but also by as many States as possible in general.[276] The ultimate purpose is to maintain international peace and security,[277] through the freedom of access to space for all, for peaceful purposes and the preservation and security of space objects, taking into account the considerations for legitimate defence of States.[278] The drafters of the Code made an effort to show that it was actually a codification of new best practices,[279]

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[272] Isabelle Soubrès-Verger, *La militarisation de l'espace: perspective européenne*, 29 ANNALS AIR & SPACE L. 357, 359 (2004).

[273] *Id.* at 374.

[274] European Council Document 14455/10 (2010), *Council Conclusions concerning the revised draft Code of Conduct for Outer Space Activities* [hereinafter Draft Code of Conduct].

[275] *Id.* at 2.

[276] *Id.* art. 1,§4.

[277] *Id.* art. 1,§1.

[278] *Id.* art. 2.

[279] *Id.* art. 1,§3.

though in fact it is, as the following analysis of the most important provisions will demonstrate, a reiteration of the current legal regime governing outer space.

In particular, under Article 3 of the Draft Code of Conduct, Subscribing States take to re-affirm their commitment to the existing legal framework and take steps of progress, application and adherence to the following international instruments:

> (a) the existing framework regulating outer space activities, inter alia:
>
> - the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967);
> - the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968);
> - the Convention on International Liability for Damage Caused by Space Objects (1972);
> - the Convention on Registration of Objects Launched into Outer Space (1975);
> - the Constitution and Convention of the International Telecommunications Union and its Radio Regulations (1995), as amended**;**
> - the Treaty banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (1963) and the Comprehensive Nuclear Test Ban Treaty (1996); and
> - the International Code of Conduct against Ballistic Missile Proliferation(2002).
>
> (b) Declarations and Principles, inter alia:
>
> - the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space as adopted by UNGA Resolution 1962 (XVIII), (1963);

- the Principles Relevant to the Use of Nuclear Power Sources in Outer Space as adopted by UNGA Resolution 47/68 (1992);
- the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries as adopted by UNGA Resolution 51/122 (1996); and
- the Recommendations on the Practice of States and International Organisations in Registering Space Objects as stated in UNGA Resolution 62/101 (2007).[280]

Emphasis should be given to the characterisation of States just before the listing of the aforementioned instruments. States are called "subscribing," for they are not bound by the Code of Conduct, nor do they have to be Parties or signatories to the aforementioned instruments. It should also be noted that the Moon Agreement does not form part of the list of instruments of Article 3, whereas non-binding documents, such as the 1962 Legal Principles Resolution, which was later incorporated in the Outer Space Treaty, or the principles relevant to the use of nuclear power sources and the declaration on international cooperation, are included in this enumeration. It is doubtful that the inclusion of this soft law instruments in another soft law document, such as the Code of Conduct, will somehow strengthen their legal value. Without being too cynical about it, one would have to assume that there must be some kind of intention behind this inexplicable choice, for it would be too easy to just think of this selection as the result of "clumsy" drafting.

Article 5 of the Draft Code of Conduct addresses the issue of space debris, in providing that States should "refrain from the intentional destruction of any on-orbit space object or other activities which may generate long-lived space debris."[281] Reference is also made to the UN Space Debris Mitigation Guidelines[282], however it makes no further references to what States should do to

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[280] *Id.* art. 3.
[281] *Id.* art. 5,§1.
[282] G.A. Res. 62/217, U.N. Doc. A/RES/62/217 (Feb. 1, 2007).

remove the existing debris, or indeed provide any tangible example of best practices in this field.

Last but not least, some special attention should be paid to the provisions of Articles 6, 8 and 9, which are all included under the general title "Cooperation Mechanisms" and respectively read as follows:

> Article 6. Notification of outer space activities
>
> 6.1. The Subscribing States commit to notify, in a timely manner, to the greatest extent feasible and practicable, all potentially affected Subscribing States on the outer space activities conducted which are relevant for the purposes of this Code, inter alia:
>
> - scheduled manoeuvres which may result in dangerous proximity to the space objects of both Subscribing and non-Subscribing States;
> - pre-notification of launch of space objects;
> - collisions, break-ups in orbit, and any other destruction of space objects generating measurable orbital debris which have taken place;
> - predicted high-risk re-entry events in which the re-entering object or residual material from the re-entering object either likely would survive to cause potential significant damage, or might cause radioactive contamination; and
> - malfunctioning of orbiting space objects which could result in a significantly increased probability of a high risk re-entry event or a collision between space objects in orbit.
>
> 6.2. The Subscribing States commit to provide the notifications described above through diplomatic channels, or by any other method as may be mutually agreed.
>
> Article 8. Information on outer space activities
>
> 8.1. The Subscribing States resolve to share, on an annual basis, where available and appropriate information on:

- their space policies and strategies, including basic objectives for security and defence related activities in outer space;
- their space policies and procedures to prevent and minimise the possibility of accidents, collisions or other forms of harmful interference;
- their space policies and procedures to minimise the creation of space debris; and
- efforts taken in order to promote universal adherence to legal and political regulatory instruments concerning outer space activities;

8.2. The Subscribing States may also consider providing timely information on space environmental conditions and forecasts to the governmental agencies and the relevant nongovernmental entities of all space faring nations, collected through their space situational awareness capabilities.

Article 9. Consultation mechanism

9.1. Without prejudice to existing consultation mechanisms provided for in Article IX of the Outer Space Treaty of 1967 and in Article 56 of the ITU Constitution, the Subscribing States have decided on the creation of the following consultation mechanism:

- A Subscribing States that may be directly affected by certain outer space activities conducted by one or more Subscribing State(s) and has reason to believe that those activities are, or may be contrary to the core purposes of the Code may request consultations with a view to achieving mutually acceptable solutions regarding measures to be adopted in order to prevent or minimise the inherent risks of damage to persons or property, or of potentially harmful interference to a Subscribing State's outer space activities.
- The Subscribing States involved in a consultation process commit to:

- consulting through diplomatic channels or by other methods as may be mutually determined; and
- working jointly and cooperatively in a timeframe sufficiently urgent to mitigate or eliminate the identified risk initially triggering the consultations.

- Any other Subscribing State(s) which has reason to believe that its space activities would be affected by the identified risk and requests to take part in the consultations is entitled to take part, with the consent of the Subscribing State(s) which requested consultations and the Subscribing State(s) which received the request.
- The Subscribing States participating in the consultations are to seek mutually acceptable solutions in accordance with international law.

9.2. In addition, the Subscribing States may propose, on a voluntary basis, to create a mechanism to investigate proven incidents affecting space objects and to collect reliable and objective information facilitating their assessment. The mechanism, to be determined at a later stage, should utilize information provided on a voluntary basis by the Subscribing States, subject to national laws and regulations, and a roster of internationally recognised experts to undertake an investigation. The findings and any recommendations of these experts are to be advisory, and are not binding upon the Subscribing States involved in the incident that is the subject of the investigation.[283]

Presented in their entirety, these provisions clearly demonstrate the intention of recirculating, or perhaps even duplicating, already existing information, exchanged among States through COPUOS, by the creation of completely new and different mechanisms, such as biannual meetings of the subscribing States. The creation of an additional layer of international dialogue, as a means of solving the existing problem resulting from the various

[283] Draft Code of Conduct, *supra* note 274, arts. 6, 8 & 9.

military uses of outer space, appears to the more sceptical eyes as a further attempt to by-pass the UN institutions and segregate outer space from its jurisdiction.

E. The issue of verification of space objects.

The issue of verification has been almost synonymous to the effort to control an arms race at a global level ever since World War II. At first aimed primarily towards monitoring the compliance of disarmament of nuclear weapons, verification has nowadays gone a long way from the 1962 proposals of both the USSR and the USA about a "general and complete disarmament" that included relevant verification procedures.[284] As a process tied to an arms control instrument, verification takes place in three different stages: first, the activities of the parties to the disarmament treaty have to be mutually monitored; second, the information resulting from such monitoring procedure must be interpreted and analysed; and third, an assessment must be made as to what kind of risk the activities of the monitored State parties pose for the security of the monitoring and assessing State.[285] It is evident that the greatest burden of the verification process falls upon the shoulders of the intelligence services worldwide, as they are expected to perform all three stages before final action, if any, is to be taken. For indeed, even in cases where violations of a disarmament treaty have been discovered through the verification process, it is not necessary that action was taken against the violating State. Disarmament treaties are a prime example of international law working on the basis of reciprocity: if one State does not fulfil its international obligation *vis-à-vis* its contractual counterparts, then they in return can delay the fulfilment of theirs, action which could be easily described as taking countermeasures against the offending State.[286] In fact, a State or the States towards this obligation is owed can assert the international respon-

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[284] *See* Nicolas Mateesco Matte, *International Verification Procedures: Past and Future Prospects*, 11 ANNALS AIR & SPACE L. 237 (1986).

[285] ISABELLA H. PH. DIEDERIKS-VERSCHOOR & VLADIMIR. KOPAL, AN INTRODUCTION TO SPACE LAW 138 (Kluwer Law International 2008).

[286] Linos-Alexandre Sicilianos, *Les réactions décentralisées à l'illicite: Des contre-mesures à la légitime défense* 501-525 (Librairie générale de droit et de jurisprudence, Paris 1990).

sibility of the State violating the provisions of the disarmament instrument, as its non-compliance "[i]s of such a character as radically to change the position of all the other States to which the obligation is owed with respect to the further performance of the obligation."[287] Additionally, the affected State or States can in fact suspend or even terminate the disarmament treaty, even towards those other Parties that were at all times acting lawfully,[288] since the obligation of lawful performance is effectively conditioned upon and requires the performance of all the other parties as well.[289] A strong interest on behalf of all State parties in the cessation and the reparation of the unlawful act is a precondition to claiming such international responsibility,[290] which evidently exists in the case of reducing space arsenals in a significant manner.

Verification is indeed believed to be a *conditio sine qua non* for the concluding of an arms control agreement.[291] Scholars have been actively advocating the need to enhance the equipment available, mostly on military satellites, so that more accurate and precise data can be collected, making it thus easier to discover violations of the agreement and leaving little room to the violating State to conceal its unlawful conduct.[292]

Therefore, one of the most important provisions of the ABM treaty and the SALT-I is that prohibiting any interference with the "national technical means"[293] of the other party, used for treaty compliance verification purposes.[294] Although not defined in

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[287] ASR, *supra* note 50, art. 42(b)(ii).

[288] VCLT, *supra* note 99, art. 60,§2.

[289] ASR, *supra* note 50, at 119.

[290] *Id.*

[291] Carl Q. Christol, *The Use of Outer Space for Peaceful Purposes, Legal and Political Considerations*, *in* PROCEEDINGS 28TH COLLOQUIUM 4-7 (Stockholm 1985); A. S. Piradov & B. C. Maiorsky, *On the Question of the Non-Use of Force in Outer Space and from Space Against the Earth (components of an international legal regime)*, *in* PROCEEDINGS 27TH COLLOQUIUM 349-353 (Lausanne 1984); Nicolas Mateesco Matte, *International Verification Procedures: Past and Future Prospects*, 11 ANNALS AIR & SPACE L. 237 (1986); Ivau Kotlyarov, *Space Law and International Control*, 3 SPACE & L. 147 (1985).

[292] HE QIZHI, I TOWARDS LEGAL CONTROL OF SPACE ARMS, A DIFFICULT PROCESS, ARMS CONTROL AND DISARMAMENT IN OUTER SPACE 125-141 (1985).

[293] David A. Koplow, *Arms Control Inspection: Constitutional Restrictions on Treaty Verification in the United States*, 63 N.Y.U. L. REV. 229, 240 (1988); Louis Haeck, *Le droit de la guerre spatiale*, 16 ANNALS AIR & SPACE L. 307, 329 (1991).

[294] ABM Treaty, *supra* note 236, art. XII; SALT I, *supra* note 236, art V.

these instruments, it was understood that "national technical means" referred to the intelligence capacities of a State used to collect data from outside the monitoring State,[295] including land-based and mobile radar, various kinds of sensors and reconnaissance satellites and space-based sensors.[296] A similar provision was also included in the Treaty on Conventional Armed Forces in Europe,[297] concluded between the then NATO States and six former States of the Warsaw Pact, the only exception being that the protection from interference is also granted to multinational technical verification means.[298] The CFE Treaty nowadays has been amended to include as many as 30 States, preventing them from interfering purposefully with the national technical means of the other signatories, unless acting in self-defence or under a Security Council authorisation.[299]

It should be noted however that the ABM Treaty and the SALT-I were not the only effort to address the issue of disarmament verification. In fact, in 1978 France proposed the creation of an International Satellite Monitoring Agency (IMSA)[300] for the purposes of verifying the progress of arms control and disarmament agreements,[301] a suggestion which was most welcome by the academic community.[302] Despite the positive reaction of the academic world and the fact that nothing in international law in general and space law in particular prevents the establishment of such an international monitoring organisation, the French proposal was dropped, as the USA considered the project financially unattractive, with the USSR making no comments at the time.[303]

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[295] Christopher M. Petras, *"Eyes" on Freedom – A View of the Law Governing Military Use of Satellite Reconnaissance in US Homeland Defense*, 31-I J. SPACE L. 81, 91 (2005).

[296] Koplow, *supra* note 293.

[297] 1990 Treaty on Conventional Armed Forces in Europe, 30 I.L.M. 1 [hereinafter CFE Treaty].

[298] *Id.* art. XV.

[299] Christopher Petras, *The Debate over the Weaponization of Space – A Military-Legal Conspectus*, 28 ANNALS AIR & SPACE L. 171, 194 (2003).

[300] G.A. Devoted to Disarmament, *French Proposal for Establishment of Int'l Satellite Monitoring Agency (ISMA)*, U.N. Doc. A/S-10/AC.1/7 (June 1, 1978).

[301] Ram Jakhu & Riccardo Trecroce, *International Satellite Monitoring for Disarmament and Development*, 5 ANNALS AIR & SPACE L. 509, 511 (1980).

[302] He Qizhi, *Space Arms Control and International Verification*, *in* AN ARMS RACE IN OUTER SPACE, PROCEEDINGS OF A SYMPOSIUM 119-125 (McGill University 1985).

[303] DIEDERIKS-VERSCHOOR, *supra* note 285, at 139.

A little more than a decade later though, and just before its collapse, the USSR proposed the creation of a monitoring organ within the UN for the purposes of arms control and disarmament treaty compliance verification purposes.[304] In the meantime, the USSR had made repeated proposals to the UN about the adoption of an international instrument of complete space disarmament.[305] All proposals included verification processes, which would be realized by the use of national technical means,[306] which were to be protected.[307] In fact, these proposals echoed to a great extent the provisions already included in the ABM Treaty and the SALT-I and SALT-II, which were however binding only between the USA and the USSR. Despite any weaknesses, scholars seemed amenable towards the adoption of the instruments proposed by the USSR, since they believed "it could serve the cause of strengthening confidence among States in the process of demilitarization of outer space,"[308] as the use of force anywhere in space and against any space object placed anywhere in space (space, orbit, celestial body) was expressly prohibited.[309] The Soviet proposals were further supported by the very optimistic plan proposed in the mid-1980s by the USSR to eliminate nuclear weapons by the beginning of the new millennium, which would combine the creation of a nuclear free world with the maintenance of a peaceful outer space.[310] None of the proposals made by the USSR managed to acquire sufficient support in the UN so as to be adopted. Instead, throughout the

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[304] G. P. Sloup, *Arms Control Verification – The Poor Person's Approach*, *in* PROCEEDINGS 29TH COLLOQUIUM 77-83 (Innsbruck 1986); Bhupendra Jasani, *ISMA – Will it ever happen?*, 8 SPACE POL'Y 13 (1992).

[305] G.A. Res. 36/192, U.N. Doc. A/36/192 (Dec. 17, 1981); G.A. Res. 38/194, U.N. Doc. A/38/194 (Dec. 20, 1983).

[306] Sune Danielsson, *Examination of Proposals Relating to the Prevention of an Arms Race in Outer Space*, *in* NANDASIRI JASENTULIYANA (ED.), MAINTAINING OUTER SPACE FOR PEACEFUL PURPOSES – PROCEEDINGS OF A SYMPOSIUM HELD BY THE UNITED NATIONS UNIVERSITY 277-289, at 281 (The Hague 1984).

[307] Article 4 Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space: Article 4 Draft Treaty on the Prohibition of Use of Force in Outer Space and From Space against the Earth.

[308] Carl Q. Christol, *Arms Control and Disarmament in Space: The Rough Road to Vienna 1984*, 1 SPACE POL'Y 26, 41 (1985).

[309] Yuri M. Kolossov, *Non-Use of Force in Outer Space*, *in* PROCEEDINGS 26TH COLLOQUIUM 205-209 (Budapest 1983).

[310] Vladlen S. Vereshchetin, *Strategic Defense Initiative and International Law*, *in* PROCEEDINGS 29TH COLLOQUIUM 94-99 (Innsbruck 1986).

1980s and henceforth, the UN had entered the soft law era of space law. Just in 1981 as many as 48 Resolutions were adopted by the General Assembly with regards to disarmament. For the purposes of the present Article, the most important of them was the Resolution Preventing an Arms Race in Outer Space,[311] for it was the beginning of the PAROS era.

EPILOGUE

The present Article attempted to highlight some of the problems that the rapid increase of and dependence upon military applications of outer space has created. While voices have been heard that the current legal regime is vulnerable to the challenges posed by the ever-developing State practice in the field of space militarisation,[312] it is my contention that the current legal regime, if applied correctly and consistently, can address the majority of these problems.

Under Part I, it was demonstrated that general space law and general public international law can coexist harmoniously, in order to maintain international peace and security, an aspect of which is safeguarded by demanding the use of outer space for peaceful purposes. While the term "peaceful" has been considered as rather nebulous,[313] its true meaning can be understood better when put it context. The oxymoron of allowing non-aggressive military uses of space is in fact perfectly rational: if we accept that measures utilising force can be taken down on Earth for the maintenance, or even restoration, of international peace and security, then we have to accept that similar measures should be considered permissible under international space law. Examples of military uses of civilian/commercial space assets,[314] especially when under the auspices of the UN, such as those of INMARSAT during the early 1990s,[315] further prove this point. General international law has developed over the years to a sufficient degree to

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[311] G.A. Res. 36/97, U.N. Doc. A/RES/36/97C (Dec. 9, 1981).

[312] DIEDERIKS-VERSCHOOR, *supra* note 285, at 144.

[313] Stephen Gorove, *Arms Control Provisions in Outer Space Treaty: A Scrutinizing Reappraisal*, 3 GA. J. INT'L & COMP. L. 114, 120 (1973).

[314] *See* Morgan, *supra* note 150.

[315] Wolf D. von Noorden, *INMARSAT Use by Armed Forces: A Question of Treaty Interpretation*, 23-I J. SPACE L. 1, 8 (1995).

allow for specific prerequisites to determine the lawfulness of State action with regards to outer space,[316] prerequisites that contemporary (defensive) technology can in fact meet, or should at least strive to meet through improvement.

Part II addressed some of the contemporary challenges to the current legal regime,[317] by providing specific examples of action and the proposed methods of resolving the problematic situations. The proposals submitted by various States and the reluctance or enthusiasm with which they were treated by the international community prove in the clearest way possible that the prospect of amending the current legal framework in order to modernise it, will be nothing short of a cumbersome and time-consuming endeavour. With the situation in outer space changing so rapidly, it is questionable whether the international community can afford the wait and the quantities of ink to be spilled, before a compromising solution can be reached. And indeed, a compromise would be necessary, in order to balance the conflicting interests of actual and potential space-faring Nations, which do not partake in the space race on an equal financial, technological and capacity footing.[318] The antagonism demonstrated with the recent ASAT tests is just the tip of what could be a really big iceberg of a Cold-War-reminiscent arms race between incumbent and emerging space powers.[319] It would seem more prudent for States to re-evaluate their own conduct, so as to make it compatible with both the letter and the spirit of the law as it stands, instead of seeking to bend the law to their will.[320] It is true that what is urgently needed is the standardisation of terms and expression in the legal instruments currently in effect; however the current state of things shows that States lack the political will to engage in such a fruitful and meaningful discussion, all being preoccupied and focused on their individual interests.

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[316] *See* Ricky J. Lee, *The Jus ad Bellum in Spatialis: The Exact Content and Practical Implications of the Law on the Use of Force in Outer Space*, 29-I J. SPACE L. 93 (2003).

[317] *See* Nair, *supra* note 224.

[318] Stephen Gorove, *Arms Control in Space: Issues and Alternatives*, 33 ZEITUNG FÜR LUFT UND WELTRAUMRECHT 191, 194 (1984).

[319] Maogoto, *supra* note 11, at 17.

[320] *See* Major David L. Willson, *An Army View of Neutrality in Space: Legal Options for Space Negation*, 50 A.F. L. REV. 175 (2001).

If anything, what I believe is really needed in outer space, is closer, international, honest and meaningful cooperation among all States,[321] in order to safeguard the continuous enjoyment of space-related benefits. It is important to remember that such cooperation is not a eulogy, but in fact an international legally binding obligations upon States, pursuant to Article IX of the OST.[322] The new conditions created by the increasing correlation between civilian and military applications of outer space will continue to challenge the current legal framework, due to the (presumed) implications created for national security.[323] States must face these new developments on a multilateral, global level, even more so when they are, actually or potentially, affecting international peace and security.

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[321] *See* Eilene Galloway, *Maintaining International Space Cooperation for Peaceful Uses*, 30-II J. SPACE L. 311 (2004).

[322] Michael C. Mineiro, *FY-1C and USA-193 ASAT Intercepts: An Assessment of Legal Obligations Under Article IX of the Outer Space Treaty*, 34-II J. SPACE L. 321, 340 (2008).

[323] *See* Captain Michael R. Hoversten, *U.S. National Security and Government Regulation of Commercial Remote Sensing from Outer Space*, 50 A.F. L. REV. 253 (2001); Major Christopher M. Petras, *"Space Force Alpha": Military Use of the International Space Station and the Concept of "Peaceful Purposes"*, 53 A.F. L. REV. 135 (2004); Major Elizabeth S. Waldrop, *Integration of Military and Civilian Space Assets: Legal and National Security Implications*, 55 A.F. L. REV. 157 (2006).

NEW HABITS AND HARD LAW: PUTTING OLD SOFT LAW "SANCTIONS" AND THE SPACE DEBRIS EPIDEMIC OUT TO PASTURE

George T. Lyons III[*]

INTRODUCTION

On January 11, 2007, the People's Republic of China undertook an Anti-Satellite Technology (ASAT) interception of the FY-1C weather satellite at an altitude of approximately 525 miles above the earth's surface. Although there have been numerous criticisms advanced concerning the actual interception and its ineffectiveness in minimizing the amount of debris this event created, the largest body of international disapproval has come from the events leading up to the actual test. China provided absolutely no method of notification or justification to the rest of the world prior to their ASAT test. This lack of notification was seen by many as a direct violation of Article IX of the Outer Space Treaty (OST). Although a direct violation of Art. IX of the OST was not established or sought for sanction by the international community, a large number of critics classified the actions of China, undeniably, as in opposition to the spirit of the OST.

Almost a year later, the United States commenced what would be viewed by many as a more responsible ASAT engagement in their interception of the US-193. Prior to the interception of US-193, the U.S. undertook numerous actions to insure that the international community, many of which whom still adhere strict-

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ly to the fundamentals of the OST, would be on alert of the United States' intentions and justifications for the interception of US-193. While the U.S. could be applauded for their efforts in attempting to lead by example in following closer to the requirements of Art. IX of the OST, their adherence has done little to resolve the ambiguities presented at the core of the language contained in Art. IX of the OST.

This paper will serve to analyze the most beneficial domestic and international response that might be conjured in the wake of the interceptions of FY-1C and US-193. Part I of this paper will serve to establish some historical context of exactly what measures were implemented by the U.S. and China before conducting their interceptions of US-193 and FY-1C respectively. Part II of this paper will serve to provide an analysis of the concepts of hard vs. soft international law, as well as some respective strengths and weaknesses of both. Part III will provide what might be the best-case scenario for handling the ambiguities and varying interpretations of the modern OST schedule and the subsequent responsible space exploration standards. Finally, Part IV will provide a sort of "test case" of implementing such solutions presented in Part III, in order to discuss the realistic costs, as well as supposed benefits that would be gained by implementing such legal remedies.

The concept of competitive interests within the realm of international law and politics is not a novel one, but at this point, clarity must be provided immediately. The proliferation of space debris caused by improper and inconsiderate ASAT testing, as well as decades of irresponsible launching tactics, has led to an epidemic that grows larger every day. International standards and clarity must be established soon in order to mitigate the damages constantly proliferated by such an enormous problem.

The United States has the opportunity, privilege, and obligation to lead humanity into the next generation of responsible ASAT testing, and apply those responsible testing tactics to the gamut of launching activities pursued by spacefaring nation-states abroad. Although the reformation of ASAT testing that will be facilitated by a more stringent analysis of the events in US-193 vs. FY-1C, such an analysis is only one cog in the machine drives the discussion of responsible space exploration, however, it is ab-

solutely vital to its success. The U.S. has grasped the helm of space exploration since its inception and should absolutely hold fast to it now.

I. FY-1C, US-193, AND ART. IX OF THE OST

A. The Outer Space Treaty

In 1965 and 1966, the United States, in pursuance of a solution to the ever-growing weapons proliferation that was occurring between it and the U.S.S.R, looked in part to the construction of the most relevant internationally-binding treaty.[1] After lengthy negotiation, drafting, and redrafting efforts between the U.S. and the U.S.S.R, this solution would eventually become the Outer Space Treaty (OST). Upon unanimous Senate ratification approval, the OST went into effect on October 10th, 1967.[2] Although the OST contains the most in-depth and comprehensive legal obligation and analysis ever created by an internationally-binding space exploration treaty, the focus of this paper will be constrained simply to a discussion of Art. IX of the OST. Art. IX states simply,

> In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference

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

[2] *Id.*

> with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.[3]

While the language of Art. IX looks exceedingly clear in the expectations it purports to establish in examining the proper notification that should be delivered to other State Parties before any space exploration might be conducted, the vast majority of problems have been derived from two phrases contained within Art. IX. These phrases are "reason to believe"[4] and "potentially harmful interference"[5] and both seem pretty soft, comparatively, in their exact obligation requirements. This legal softness has allowed a virtual gamut of interpretation internationally. Varying interpretations have been influenced slightly by conversations surrounding the true "spirit of the treaty" that should be considered in attempting to narrow the actual expectations of Art. IX. Such attempts, however, often create more complex and convoluted subsequent discussions, spurring more confusion than clarity. There have also been attempts internationally by current space powers to "lead by example" and create a narrowing of exactly what expectations are mandated by Art. IX, however, such efforts are often viewed as more illustrative than impactful on the nations that need the most immediate sanctions for irresponsible space activity. One such comparison is illustrated by the Art. IX notification actions conducted by China in their interception of FY-1C compared to those conducted by the U.S. in their interception of US-193.[6]

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[3] *Id.* at art. 9.

[4] *Id.*

[5] *Id.*

[6] This analysis, provided in the subsequent sections "B) The Interception of FY-1C" and "C) The Interception of US-193" were originally, in large part, included in the background analysis section of the paper, George T. Lyons III, *Orbital Debris: A Scien-*

B. The Interception of FY-1C

On January 11th, 2007, China intercepted the Fengyun 1C (FY-1C) geostationary weather satellite, utilizing long range Anti-Satellite Weaponry (ASAT) technology.[7] The FY-1C was initially launched on December 8, 2006, and was to be primarily used in providing images of "cloud conditions, typhoons and storms every half an hour, and data to infer sea temperatures and winds parking over 86.5 E longitude."[8] China gave no warning to other nations of their intentions to destroy the FY-1C.[9] This lack of notification provided no risk assessment to other nations concerning the potential threat to such nations' space assets.[10] Although there is some debate as to the functional status of FY-1C at the time of its interception, such a discussion lends itself to an entirely different body of legal analysis. For the purposes of this paper, it will be assumed that the FY-1C was in fact inoperable at the time of its interception and thus its interception might be justified under relevant international interpretations. There is also a large potential discussion to be had concerning the legitimacy of China's *realistic positive expectations* in intercepting the FY-1C at such a high altitude, but, for the purposes of this paper, it will also be assumed that China had the utmost hope of a successful interception of FY-1C.[11] In any event, after the interception of FY-1C,

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tific Approach to an International Diplomatic Problem (2013) [available upon request]; moreover, while it is strictly the purpose of the author to include these sections for further clarity and depth surrounding factual events that precluded the international diplomatic efforts this paper strives to discuss, candor and transparency concerning their origins must be included as well.

[7] *OASD Satellite Engagement Communications Plan* (Feb. 14, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 28, 37 (compiled by P.J. Blount, 2009).

[8] *SPACEWARN Bulletin, No. 638* (Jan. 1, 2007), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 5, 8 (compiled by P.J. Blount, 2009).

[9] *OASD Satellite Engagement Communications Plan* (Feb. 14, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 28, 37 (compiled by P.J. Blount, 2009).

[10] *Id.*

[11] This is a not assumption that the author personally adheres to. In fact in writing *Orbital Debris: A Scientific Approach to an International Diplomatic Problem* (2013) [available upon request], the author outlines the scientific impossibility of conducting a space debris conscious ballistic ASAT interception at this altitude. Because this isn't the primary focus of this paper, however, the discussion will be limited to China conducting a "good-faith" interception of the FY-1C satellite.

China created an estimated 2,841 pieces of new orbital debris.[12] China's interception of FY-1C ranks number one on the list of the top ten space junk causing missions of all time, surpassing the runner-up mission on the list by almost 250 percent.[13]

In the wake of China's interception of FY-1C, Gordon Johndroe, speaking for the National Security Council, said "[t]he U.S. believes China's development and testing of such weapons is inconsistent with the spirit of cooperation that both countries aspire to in the civil space area."[14] Responding to the international criticism, Liu Jianchao, the Chinese foreign ministry spokesman, also held a press conference to reiterate that "China has always advocated the peaceful use of space, opposes the proliferation of weapons in space… has never and will never participate in an arms race in space."[15] Jianchao reiterated that "[t]his test was not directed at any country and does not constitute a threat to any country…. [a]fter various parties expressed concern we explained this test in outer space to them."[16] Jianchao summed up blatantly, "China has nothing to hide."[17] Many saw the actions of China, and the lack of any notification required under Art. IX of the OST, as a direct slap in the face to those notification requirements mandated by the OST. Again, the outcome of this test and the justifications China used in explain their adherence to Art. IX of the OST hinged on their careful explanation of just what they assumed was mandated by Art. IX and their adherence to it. Although many international OST parties disagreed, China saw itself within the requirements of Art. IX because they did not foresee any potential "reason to believe"[18] that their interception of FY-1C could result in any "potentially harmful interference"[19] with other nation-

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[12] NASA IDENTIFIES TOP TEN SPACE JUNK MISSIONS, http://www.networkworld.com/community/node/64242 (last visited Nov. 31, 2013).

[13] *Id.*

[14] Marc Kaufman, *China Criticized for Anti-Satellite Missile Test*, THE WASHINGTON POST (Jan. 19, 2007), http://www.washingtonpost.com/wp-dyn/content/article/2007/01/18/AR2007011801029.html.

[15] CHINA CONFIRMS ANTI-SATELLITE MISSILE TEST, http://www.theguardian.com/science/2007/jan/23/spaceexploration.china (last visited Nov. 31, 2013).

[16] *Id.*

[17] *Id.*

[18] Outer Space Treat, *supra* note 1, at art. 5.

[19] *Id.*

states space assets.[20] Although China had arguably violated the spirit of the OST, even in spite of their attempts to carefully couch their justifications for doing so in the ambiguities created by Art. IX, no direct violations of the OST could be established in order to pursue sanctions against China.[21]

C. The Interception of US-193

Almost a year after China's interception of FY-1C, the U.S. decided to intercept its own military reconnaissance satellite, the US-193. On February 20, 2008, at approximately 10:26 p.m. EST, the USS Lake Erie launched a single modified SM-3 towards the USA-193.[22] A few minutes later, a collision was detected between the SM-3 and the USA-193 that would later be confirmed as the successful interception of USA-193[23] at approximately 153 miles above the earth's surface.[24] The mission was marked as successful and initial reports estimated that as a result of its success, "nearly 100 percent of the debris safely burned-up during reentry within 48 hours the remainder would safely re-enter within the next few days."[25] Because, however, the interceptions of the FY-1C and US-193 were fundamentally, physically, and pragmatically very different, the events leading up to the interceptions are of the utmost

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[20] The language of the OST is included here to reiterate the ambiguity that might be illustrated by potential violating parties to the OST and the justifications that said ambiguity might be used to illustrate in their attempted release from liability under the OST.

[21] *Contra* George T. Lyons III, *Orbital Debris: A Scientific Approach to an International Diplomatic Problem* (2013) [available upon request] (This assumption that no direct violation of OST Art. IX occurred during China's interception of FY-1C is an assumption made strictly to facilitate the international comparative law discussion of this paper. In fact, the author personally does not subscribe to this view and has written a paper in which the direct violation of OST Art. IX by China is illustrated by utilizing a physics-based analysis. This analysis attempts to prove that any outcome other than a large contribution to orbital debris was physically impossible and China, being the hyper-advanced technological state that they are, knew this from the beginning of their endeavor).

[22] ONE-TIME MISSION: OPERATION BURNT FROST, http://www.mda.mil/system/aegis_one_time_mission.html (last visited Nov. 31, 2013).

[23] *Id.*

[24] *American Forces Press Service, "Navy Missile Hits Decaying Satellite Over Pacific Ocean"* (Feb. 20, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 121 (compiled by P.J. Blount, 2009).

[25] ONE-TIME MISSION: OPERATION BURNT FROST, http://www.mda.mil/system/aegis_one_time_mission.html (last visited Nov. 4, 2013).

importance, even when compared to the actual interception tactics of the two satellites.[26]

The U.S. went to great lengths in alerting its domestic and international communities of not only the notification of its intentions to intercept US-193, but also provided a host of justifications in doing so. Primarily, the US-193 was in low earth orbit at its time of interception and was poised to re-enter earth's atmosphere "on or about March 6, 2008."[27] Early models predicted that a satellite with the size and mass of US-193 would only lose about half of its mass to atmospheric disintegration as it reentered the atmosphere.[28] This problem was compounded by the fact that US-193 would reenter with approximately 1000 lbs. of toxic frozen hydrazine, which by all estimates would likely not melt or burn up as it reentered earth's atmosphere.[29]

While some have criticized the validity of the actual dangers of US-193 reentering the earth's atmosphere[30], the U.S. government conveyed to the world that "although the risk from a natural reentry is not high, we cannot rule out the possibility that the hydrazine fuel could cause casualties on the ground."[31] While this candor seems to be detrimental to reiterating the absolute need to intercept US-193, further good-faith and justification were provided when the U.S. sought simply to restate that "[w]e will do whatever we can to mitigate this risk."[32] Notification of USA-193's in-

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[26] *See* George T. Lyons III, *Orbital Debris: A Scientific Approach to an International Diplomatic Problem* (2013) [available upon request].

[27] *Statement by Ambassador Christina Rocca, Permanent Representative of the United States to the Conference on Disarmament* (Feb. 15, 2008),), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 63 (compiled by P.J. Blount, 2009).

[28] DOD NEWS BRIEFING WITH DEPUTY NATIONAL SECURITY ADVISOR JEFFREY, GEN. CARTWRIGHT AND NASA ADMINISTRATOR GRIFFIN, http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4145 (last visited Nov. 31, 2013).

[29] *See* Robert L. Kelley & William C. Rochelle, *Atmospheric Reentry of a Hydrazine Tank*, NASA White Paper (undated), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 17 (compiled by P.J. Blount, 2009).

[30] ANALYST: U.S. SATELLITE STRIKE WAS JUSTIFIABLE; CRITICS SUCH AS CHINA, RUSSIA, ARE OFF-BASE, http://www.satellitetoday.com/publications/st/2008/02/25/analyst-u-s-satellite-strike-was-justifiable-critics-such-as-china-russia-are-off-base/ (last visited Nov. 31, 2013).

[31] *OASD Satellite Engagement Communications Plan* (Feb. 14, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 28, 35 (compiled by P.J. Blount, 2009).

[32] *Id.*

terception was conveyed to "the United Nations Committee on the Peaceful Uses of Outer Space, the Conference on Disarmament, and members of the United Nations Security Council."[33]

The availability and readiness of the U.S. to actively seek out the notification and consultation of such a diverse panel of parties potentially privy to the OST, was a strong illustration of the type of conduct Art. IX purports to mandate. It is also important to notice that the U.S. was quick to note that all U.S. diplomatic posts would be available to "answer host government questions regarding the engagement and consequence management preparations."[34] This is an important assertion by the U.S. because it reiterated an often overlooked portion of Art. IX. That portion is the part that creates an option for "consultation concerning the activity or experiment" for all nations who have "reason to believe that an activity or experiment planned by another State Party in outer space" might in fact "cause potentially harmful interference with activities in the peaceful exploration and use of outer space."[35] Basically, the U.S. took the opportunity to say *you have the option to consult with us about anything we do that you might view as potentially harmful, and better yet, our diplomatic posts' doors are wide open!* Again, this is maybe a little rhetorical, but it just provided one more good-faith effort to notify the parties privy to the OST of the U.S.'s intentions in intercepting US-193.

One final tactic implemented by the U.S. in preparing for OST party response, the U.S. reiterated that it would be absolutely liable for any damages caused by on earth or to other object in flight that resulted from its interception of US-193.[36] While this could be viewed as outside of the scope of Art. IX, it was just one more cog in the wheel of good-faith notification the U.S. was establishing pursuant to Art. IX.

While the U.S.'s interception of US-193 looks immensely more successful when held in comparison to China's interception

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[33] *Id*. at 39.

[34] *Id*.

[35] Outer Space Treaty, *supra* note 1, at art. 5.

[36] *OASD Satellite Engagement Communications Plan* (Feb. 14, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 28, 39 (compiled by P.J. Blount, 2009) (this seemingly new obligation was just a reiteration and affirmation of the U.S.'s continued involvement in the 1972 Convention on International Liability for Damage Caused by Space Objects).

of FY-1C, it is more important to reiterate again, that the true success of the U.S. was seen in the extensive measures it sought to undertake in notifying parties to the OST of its intentions to intercept US-193 pursuant to Art. IX expectations. No matter how successful the U.S. could hold its technical capabilities and accomplishments to be, no real precedent or binding authority could be enforced against China and their seemingly irresponsible interception of FY-1C in light of the U.S.'s interception of US-193 because the two events were conceptually and physically so distant. Simply stated, it was not the U.S.'s employment of some magical missile or striking technology that made their engagement of US-193 more successful, it was strictly the altitude at which each party chose to engage.

This struggle for authority, applicability, and enforceability is one that continues to plague the two countries (as well as the many other parties to the OST) today. What would ultimately be the most comprehensive, fair, and enforceable result to insure that the horrific proliferation of space debris is not a problem that continues to grow every year? The answer is extremely complex and before the discussion can even begin, some ground rules must be laid out in order to facilitate a fair discussion concerning the benefits and costs of several international law conclusions.

II. HARD LAW VS. SOFT LAW

Although the title implies otherwise, the conversation surrounding what would constitute the most appropriate international law measures requires more than a verdict between two polar concepts; moreover, the interpretation of concepts such as hard law vs. soft law, must not be viewed as an either/or decision. Instead, the two concepts should be viewed as two components at two different ends of a sliding scale, among which the appropriate solution will be the product of constantly reevaluating precisely where the most appropriate solution falls on such a sliding scale. To simplify such a hard law/soft law dichotomy, recall the concept of a number line. On one end of the number line lies the concept of hard law and on the other lies the concept of soft law. In evaluating the measure appropriate to deal with each circumstance, you must continuously evaluate what the highest priorities of the nation and its citizens are, compared to the greater good of all of

humanity. Every decision will bear an effect on your position on the number line and a summation of these decisions will ultimately constitute your final position on the number line. Some varying considerations and examples of hard law/soft law can ultimately help to determine what would be the most effective domestic and international solution to the problematic ambiguities created in the range of interpretations and treatments of Art. IX of the OST.

A. Hard Law

The concept of hard law might be most easily illustrated by a few phrases that are constantly thrown around when describing such hard laws. Such terms include: binding, most restrictive, clearly defined, sanctionable, multilateral, precise, and other such phrases. Perhaps another way to illustrate hard law is to look to some examples of international diplomacy that are considered hard law. Treaties are often interpreted as some of the "hardest" international law available to the international legal psyche. This is due in large part to the supposed binding authority that a treaty enforces on all parties who are signers. Typically, a treaty also authorizes or creates a governing body that oversees the adjudication of violations and their subsequent sanction for violation. The simple need to create an international body that strives to enforce and sanction subsequent violations of such international law led to the formation of the United Nations in 1942.[37] It is also worth noting that while many countries have authorized one leader or diplomat who is authorized to sign off for his/her respective nation in order to join whatever treaty they see as in the best interest of their country, this, however, is not the case in the U.S.[38] Although such countries who have authorized one figurehead to establish their commitment to whatever UN treaty they see fit might have an easier time in getting their nation-state signed off on a treaty, a treaty commitment from a country that requires a vastly complex democratic process before ratifying and joining any interna-

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[37] HISTORY OF THE UNITED NATIONS, http://www.un.org/en/aboutun/history/ (last visited Nov. 31, 2013).

[38] Treaties, *Ch.1: The Senate's Role in Treaties*, *available at* http://www.senate.gov/artandhistory/history/common/briefing/Treaties.htm (last visited Nov. 31, 2013).

tional obligation will most certainly constitute a firmer commitment to such international hard law.[39]

While this list of hard law attributes is not exhaustive, it is helpful to consider factors that lend themselves the qualifications of what makes international hard law. These factors will come at a cost and the potential benefit gained will have to be calculated when compared to the alternative ideals that encompass a body of law known as "soft law." It is also equally important to consider the opposite end of the spectrum, soft law, which serves as a viable antitheses to the ideals that compose hard law, and the possible compromises that lie somewhere in the middle.

B. Soft Law

When considering the language that typically surrounds hard law (binding, precise, restrictive, etc.), the easiest way to imagine soft law is to break out your trusty thesaurus. Soft law is typically described using words that are almost direct antonyms of the language that describes hard law. Words that include: voluntary, compromise, non-binding, suggestive, self-regulating, loose, and the like. Soft laws are often hashed out through more diplomatic and less binding "agreements" or "coalitions" as opposed to the binding treaties that are typically reserved for hard law. By its very definition, soft law is more suggestive and persuasive towards a favorable result as opposed to a strict body of hard law that has been created to enforce and sanction violations of a specific standard or ideal. Its power is almost totally derived from its ability to persuade, rather than require mandatory adherence.

Some of the most famous bodies of soft law that have been created in the past few decades are the various Codes of Conduct created throughout the formation of the European Union (EU). These Codes of Conduct are non-legally binding documents that do not enforce any certain standard upon the parties that party to the document; instead, they operate on a clear contingency of voluntariness from parties that seek to adhere to higher standard of

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[39] *See* Treaties, *available at* http://www.senate.gov/artandhistory/history/common/briefing/Treaties.htm (last visited Nov. 4, 2013) (such is the case for a country like the United States that authorizes that the United States Senate "shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two-thirds of the Senators present concur" U.S. CONST. art. 2 § 2).

better self-regulation and practices.[40] It is important to reconsider, however, that very rarely do you find parties that adhere solely to soft law, simply because there will always be a temptation for direct influence to control the outcome of a market, no matter how self-regulated that market may become. This case is illustrated again by the current state of the Codes of Conduct in the EU's Business Regulations and Corporate Tax. Even though the primary mechanism for taxing non-resident workers has been by providing "recommendations" of a proper tax rate to businesses, these "recommendations" are deeply ensconced in a vast body of harder regulatory law that makes up the majority of the EU's Business Regulations and Corporate Tax structure.[41] This regulatory entrenchment tends to put a little pressure on businesses through other available channels and adds to the ability of regulatory markets to undercut the spirit of the seemingly voluntary and self-regulating soft-law markets. This is a direct example of what may be the most effective way of defining soft law. Soft law is simply any measure of international law that falls short of hard law. This may be an overgeneralization, but is illustrative of what could be defined on the sliding scale of hard/soft law. If, perhaps, the number line analogy is too simplified to incorporate the multi-tiered facets of diplomacy that contribute to the discussion of hard vs. soft law, a more complex, and often-used analogy is available.

C. The Abbott/Snidal Model

In their pivotal work, *Hard and Soft Law in International Governance*, Kenneth Abbott and Duncan Snidal addressed the vast complexities that drive the determinations over what exactly defines hard/soft law.[42] Opting to pursue a more detailed abbreviation than hard or soft law, Abbott breaks down the three main characteristics that vary in the conversations surrounding hard/soft law into a discussion of obligation, precision, and delega-

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[40] Mariola Seeruthun-Kowalczyk, *Hard Law and Soft Law Interactions in EU Corporate Tax Regulation: Exploration and Lessons for the Future*, 25 (University of Edinburgh 2011) *available at* https://www.era.lib.ed.ac.uk/bitstream/1842/6409/2/Seeruthun-Kowalczyk2012.pdf (last visited Nov. 31, 2014).

[41] *Id.* at 58.

[42] Kenneth W. Abbott and Duncan Snidal, *Hard and Soft Law in International Governance*, International Organization, Vol. 54, No. 3, Legalization and World Politics, 421 (The MIT Press 2000).

tion.[43] By instituting a shorthand that follows the [O{bligation}, P{recision}, D{elegation}] form, that is defined by varying degrees of intensity for each variable, Abbott created a mechanism that can drive the discussion of hard vs. soft law in a way that is not binary, but instead, descriptive of the varying degrees of the contributing factors that make up the hard vs. soft discussion.[44] The hardest of laws would be defined by [O, P, D] because a body of hard law, like a treaty, typically calls for strong obligations from the treaty seeking parties, a lot of precision within the language of the treaty, and a strong delegation body that could adjudicate any possible violations and enforce subsequent sanctions.[45] Soft law measures such as international coordination standards (akin to the Codes of Conduct discussed above) are typically defined by [-, P, d].[46] This designation again defines the typical goals and ambitions of such a type of soft law in that it would require little to no obligation, because they are voluntary, high precision, because the definitional language is narrow, and some delegation, because some monitoring may occur between participatory nations, but with no real mechanism for deterrence.[47]

Although this model is helpful in describing key considerations in each of a variety of scenarios in which international law might be molded, the most important consideration for the purposes of this paper is to consider that as any variable increases in the model, so do transactional costs and time consumption. Abbott articulates this idea very concisely,

"In sum, we argue that [nation-]states face tradeoffs in choosing levels of legalization. Hard agreements reduce the costs of operating within legal framework – by strengthening commitments, reducing transaction costs, and the like – but they are hard to reach. Soft agreements cannot yield all these benefits, but they lower the costs of achieving (some) legalization in the first place.

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[43] *Id*. at 424.

[44] *Id*. (This shorthand is further supplemented by varying degrees of intensity for each variable, ie. O = very strong obligation, o = some obligation, - = no obligation, etc. for each variable).

[45] *Id*.

[46] *Id*. at 429.

[47] *Id*.

Choices along this continuum of tradeoffs determine the "hardness" of legalization, both initially and over time."[48]

Again, this model may yield a more comprehensible discussion of what implications will flow from any decision that is implemented within the next steps taken to mold international law, but the costs and benefits of any future model must be at the forefront of any discussion and must be weighed completely before any decision can be made. This continual revaluation of the applicability and interpretation of this model will hopefully serve as a continual means of driving subsequent discussions towards an international solution.

D. Driving Discussion

Although the conversations that surround what exactly will be the most impactful and cost-effective means of drafting the new frontier of international space law are vastly complex and at times extremely frustrating, these complexities must not dampen the drive to attempt such efforts. Hard law will surely come at a high cost initially. It will take time, collaboration, and monetary commitment from a host of potential participatory parties. On the other hand, by establishing a treaty of detailed language and international expectations, as well as a governing body to oversee and enforce such a treaty, there could be a very distinct line drawn in the sky concerning what standards will be expected and enforced. By creating such a regulatory body, any ambiguities that have been created in any number of OST pseudo-violations could be cleared up and prosecuted with clearer consistency and ease. It should be noted that softer forms of law also have some very distinct advantages as well. By implementing a sort of voluntary code of conduct, initial formative costs could be minimized because it would require little negotiation or construction time/effort in that it would be a completely voluntary program, to which anyone might join.

The effects of these initial savings would be more than evidenced however on the backside of any attempt to enforce any violation of some code of conduct that is as easy to voluntarily leave as it was to join. Although there hasn't been a clearly defined solu-

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[48] *Id*. at 436.

tion to emerge yet, there are a couple of tactics that could be pursued in order to reconsider the ever-present problem of existing space debris, as well as the continual addition and proliferation of new space debris from irresponsible launching practices of several spacefaring nation-states. These solutions should be well defined, well thought out, and in the spirit of a nation that should continue to lead the charge for a new generation of responsible space exploration, the United States.

III. SOLUTIONS AND COMPROMISES

Although there have been many projected solutions to dealing with the ambiguities skirted by many international powers attempting to not fall victim to OST violations, there are a couple of ways that the U.S. should drive the discussion forward immediately. All of these solutions will have to be presented on the back of a strong national desire to correct an internationally devastating series of irresponsible space exploration tactics. There has never been an opportunity to guide the national psyche like the present and much of this discussion might be spurned by the smash success of the international hit, *Gravity*.[49] It is always best to strike while the iron is hot, and that time is now. The United States has to lead the charge for the reformation of international space law, and there is no doubt that charge will have to begin with policy reform on American soil. Once it has established its own pinnacle standards, it would be hard, if not impossible, for the rest of the world to take note and possibly follow suite. The influence that America has wield over international discussions, surrounding international space policy, must always be at the forefront of the American diplomat's mission. The U.S. has the opportunity drive discussions of reform and improvement and should always pursue such discussions with great fervor.

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[49] GRAVITY (Warner Bros. Pictures 2013) (*Gravity* is a motion picture that deals directly with the proliferation of space debris and the potential harm it possesses to damage international assets in the earth's orbit; *Gravity* was released to international success and grossed over $218 M dollars in U.S. movie theaters alone), http://www.imdb.com/title/tt1454468/ (last visited Nov. 31, 2014).

A. Domestic Reform

1. Definition

Although many scholars have alluded to the primary necessity of defining what exactly constitutes "space debris," most all of those conversations turn to an international mandate and reformation of existing treaty language.[50] The most important realization concerning a hesitancy to reach any sort of definitional clarity at an international level is that no party really wants to take responsibility for debris they've already created. Essentially, any time one party wants to classify what constitutes space debris, the initial force of the conversation will be driven by having to define already existing space debris. Therefore, to accomplish such a definition, you would have to take into account many factors that would tend to make responsible parties increasingly hesitant about taking responsibility.[51] The problem with this rational is that it is completely self-defeating. Essentially, such parties have created a very real and a very devastating problem and because no one wants to take responsibility for their part in creating the problem, everyone sits around, attempting to avoid liability for the magnitude of space debris already in existence. This is especially problematic in the present case because there is absolutely no denying that even if there was never another object launched into earth's orbit, the current state of orbital debris will continue to have detrimental and self-proliferating effects on existing space assets into the future.[52] Therefore, there is absolutely no scenario of inaction appropriate in this circumstance.

One tactic the U.S. might explore in this area would be to go ahead and take responsibility for its contributions to existing

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[50] *See* Carl Q. Christol, *Scientific and Legal Aspects of Space Debris*, 34 ACTA ASTRONAUTICA 367 (International Academy of Astronautics 1994).

[51] *Id.* at 368 (Christol points out that one would have to analyze every piece of existing orbital debris by determining first "where the debris is located, 'the circumstances under which it came to be situated there, the intent of the…[launching entity] which placed the… space object into orbit, the physical characteristics of the debris… the range of responses available to the… [launching entity]'").

[52] Daniel Gregory, JF Mergen, & Aaron Ridley, *Space Debris Elimination (SpaDE) Phase I Final Report*, NASA NIAC—11- 11NIAC-0241, 3 (Dec. 12, 2012), http://www.nasa.gov/pdf/716066main_Gregory_2011_PhI_SpaDE.pdf (the self-proliferation of existing orbital debris is commonly known as the Kessler Syndrome).

space debris and pursue fully the gamut of options to mitigate and retract potential future harm from such debris. The counterargument here obviously becomes, *Well, how do we know what is ours?* Although the major monitoring nations, the U.S. and the U.S.S.R., are able to constantly track objects as small as four inches in diameter, it is impossible to distinguish exactly what objects belong to what nations.[53] In the vast sea of orbital space debris, however, lies several satellites that are very easily identifiable as to their country of origin. This is due in large part to the running lists of launched satellites and their operational statuses maintained by NASA, Roscosmos, and the United Nations Office for Outer Space Affairs (UNOOSA). [54]

These satellites, although the most easily tracked and assigned ownership, are the least dangerous for the same reasons. That is to say that if there were only a few big pieces to worry about, the planet would be in a lot better shape logistically because astrophysicists could track, identify, and alter any flight plans accordingly. The more dangerous circumstance is the one presently brewing in not being able to adequately track and anticipate collisions with smaller pieces of orbital debris. Although it is hard to fathom on earth, colliding with a 5 lb. chunk of space debris orbiting at 125 miles above the earth's surface would be energetically equivalent to getting hit by a full-size seventy two passenger International school bus traveling at 240 miles per hour.[55] It is easily seen that these small and seemingly untrackable pieces of space debris have the potential to cause some real damage. It should absolutely be the priority of the U.S. to accept responsibility for such inactive satellites and pursue recovery immediately before those big chunks of garbage collide with highly energetic chunks of smaller garbage and the problem further self-proliferates. This discussion, however, mandates that the issues

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[53] Nola Taylor Redd, *Space Junk: Tracking & Removing Orbital Debris*, *available at* http://www.space.com/16518-space-junk.html.

[54] SPACE DEBRIS GUIDELINES OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE, http://www.oosa.unvienna.org/pdf/publications/st_space_49E.pdf (last visited Nov. 31, 2014).

[55] This statement utilizes the Kinetic Energy equation $\Delta KE = (½)mv^2$ and assumes that the International school bus weighs 25,000 lbs. empty and that the 5 lb. chunk of space debris is traveling at 17,000 mph in order to maintain a steady orbit around the earth at an altitude of 125 miles above the earth's surface.

surrounding what exactly constitutes space debris must stop being skirted around. It is time for the United States to have a call to arms and answer for the debris it has created and follow every avenue of recovery possible.

2. Liability

One avenue that might accelerate a discussion of what exactly needs examined to be on the home front would be a dialogue surrounding potential liabilities of errand space debris that belongs to the U.S. Although the U.S. has been quick to accept responsibility for any liabilities sounding recent ASAT interceptions and subsequent issues that might arise internationally,[56] no case has been afforded to test the waters of exactly how the U.S. might react if an inactive satellite or U.S. owned space debris were to collide and injury another party.[57] In looking at the spirit of how the U.S. handled the liability notifications preceding the interception of US-193, the U.S. should go ahead and explicitly assume the responsibility for identifiable, U.S. owned, orbital debris. This also assumes that a clear definition of orbital debris has been reached, but the ultimate realization here is that because the U.S. has the most expansive and elaborate system of space assets in the world it obviously has the most to lose. Take for example, the U.S.'s ownership of the Global Positioning Satellite (GPS) network. The GPS network is perhaps the most relied upon and useful telecommunications network of all time.[58] An interruption of such a network, intentional or otherwise, would prove to be a complete catastrophe to the way of life that all Americans know and depend

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[56] *OASD Satellite Engagement Communications Plan* (Feb. 14, 2008), USA-193: Selected Documents, Special Topics in Aerospace Law, No.1, page 28, 39 (compiled by P.J. Blount, 2009).

[57] *See* Michael Listner, *Iridium 33 and Cosmos 2251 Three Years Later: Where Are We Now?*, Safety Space Magazine (Feb. 12, 2013), http://www.spacesafetymagazine.com /2012/02/10/iridium-33-cosmos-2251-years-later-learned-then/ (last visited Nov. 31, 2013) (although this collision between a Russian satellite, Cosmos 2251, and a U.S. satellite, Iridium 33, might be partially instructive as to how the two nations would settle space asset conflicts through internal negotiation, it didn't provide much instruction for OST Art. VII/1972 Liability Convention interpretation between the two countries).

[58] BRIEFING ON THE IMPORTANCE OF GPS TO U.S. CIVILIAN AND ECONOMIC INFRASTRUCTURES (Apr. 28, 2009), *available at* http://www.gps.gov/multimedia /presentations/2009/04/hill/invite.pdf.

upon. The question that begs to be answered is, *If we're not willing to take responsibility for liabilities that might result from collisions with U.S. owned/created space debris, how could we ever ask another country to take possession and liability for theirs if it were to effect American assets?* This simple scenario illustrates what many Americans take for granted every day, not fully understanding the current need for immediate action in mitigating and resolving potential threats from above to American security.

3. Backlash

Many scholars, however, have proclaimed threats to American security are what have driven the need to pursue ambiguous language because narrower language leaves America open to security threats in that it ties the U.S.'s hands from pursuing appropriate military research, development, and reaction.[59] Those same scholars, however, often reiterate the extent of exactly how many budding space capable nations, who have never been space capable in the past, are proliferating currently.[60] Obviously, these same scientists also view this proliferation as a threat to space security.[61] This stance creates a sort of a paradox in that the U.S. doesn't want to bind itself with specific language or liability in order to maintain national security, but also views this lack of responsible space exploration from budding space programs by not accepting liability for potential space debris, as a threat to national security as well. This *do as I say, not as I do* form of international influence has never and will never work effectively in the long term. Instead, the U.S. should push to narrow the definition of space debris from a domestic point of view and then become stewards of the improved term to the rest of the world. The same tactic should be employed as a blanket acceptance of the space debris the U.S. currently has floating throughout the earth's orbit. Again, this just illustrates good faith to the rest of the international space community and would drive discussions to reform and

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[59] *United States Space Systems: Vulnerabilities and Threats*, Ensuring America's Space Security, 14 (Federation of American Scientists 2004), http://www.fas.org/pubs/_docs/10072004163734.pdf.

[60] *Id*. at 15.

[61] *Id*.

amend the ambiguities created by the language of Art. IX of the OST and its lack of definition of what constitutes space debris.

B. International Influence

1. Mission: Planning, Design, Manufacture, and Operation

This title language comes directly from the *Space Debris Guidelines of the Committee on the Peaceful Uses of Outer Space* issued by the United Nations Office of Outer Space Affairs (UNOOSA).[62] It is not typically the policy of American diplomacy to take on the language of an international code of conduct and make it the U.S.'s own[63], however, in this case it would seem to be a prudent and responsible strategy to usher in the dawn of American space exploration in this manner. As U.S. space exploration becomes more and more privatized, the U.S. has to create more hardline boundaries for private companies who wish to participate in the market, in order to retain some shield from potential liability.[64] In accepting stricter language from internationally driven documents like those routinely published by UNOOSA, the U.S. could simultaneously dodge two bullets, one from the international community at large, and one domestically from the potential liability it could face if associated sufficiently with private parties it authorized to act.

One specific example that might be implemented domestically could be the legal requirement that all American satellites launched into orbit contain some retrorocket capability. In doing so, the potential problems that are implicated about exactly how companies are supposed to retrieve their satellites after launch

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[62] SPACE DEBRIS GUIDELINES OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE, http://www.oosa.unvienna.org/pdf/publications/st_space_49E.pdf (last visited Nov. 31, 2014).

[63] *Contra* Kenneth W. Abbott and Duncan Snidal, *Hard and Soft Law in International Governance*, International Organization, Vol. 54, No. 3, Legalization and World Politics, 428 (The MIT Press 2000) (One exception to this rule can be seen in the Congressional provisions making "violations of the Whaling Convention and the Convention on International Trade in Endangered Species (CITES) constitute violations of U.S. law").

[64] *See* Dalehite v. U.S., 346 U.S. 15 (1953) (Under the Federal Trade Claims Tort Act (FTCA), 28 U.S.C. § 1346(b), the U.S. may be sued, just like a private party, if it sufficiently shown that the party in litigation was acting on behalf of the U.S. government (with certain exceptions)).

are dissolved. By the simple flick of a switch, the satellite is able to slow down its stable orbital velocity and return naturally to earth, utilizing only the gravitational forces that are present on earth every day. Complications that arise under scenarios where communications have been lost with such satellites could also be mitigated with the implementation of a simple "dead man's switch" circuit.[65] Although neither one of these scenarios accounts for what could be done in the case where the satellite loses power, this would only be of concern if the satellite had already reached stable orbit before it failed.[66] Either way, it would provide a better scenario than currently employed by U.S. space exploration-centric actors.

There is no end to the number of hypotheticals that could be explored in order to increase the U.S.'s ability to safely conduct domestic space activity, but a willingness to utilize international codes of conduct in formulating our own domestic policy would provide a greater good-will showing to the rest of the international space law regimen. It would send a clear message to the rest of the world that the U.S. wants not only what's best domestically, but also what is best for the greater good of the international community as a whole. This showing would most certainly also lead to a bevy of subsequent talks and international policy reform.

2. Interpreting The OST

Another tactic that the U.S. could readily employee would be to take international treaty language, that has been well established and signed off on by a number of countries it holds in high regard, and implement that language verbatim, or maybe an even more strict interpretation, into its own domestic law. No single body of law could be as potentially important and impactful to the international spacefaring community at large that the OST. Looking at the semantics of the language included in the OST, argua-

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[65] A "dead man's switch" is a mechanical circuit that recognizes a lack of electronic activity and subsequently activates an alternative circuit path to engage a failsafe mechanism built into the machine's schematic.

[66] Otherwise it would probably fall back to earth naturally due to its inability to reach a stable orbital velocity.

bly the last major multi-national treaty on the subject[67], even its "binding language" is soft by comparison to what it could have been.

Calls for action under Art. IX are appropriate when there is "a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space… would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space."[68] This "reason to believe" language is arguably self-defining, as seen in the actions of China in the wake of their 2007 ASAT, and thus potentially highly ineffective. Alternatively, if the launching country feels they "might be potentially harmful," then "it shall undertake appropriate international consultations before proceeding with any such activity or experiment." These "appropriate international consultations" are never fully defined, but instead are sort of defined in the alternative in the remainder of Art. IX. The language of Art. IX basically says that if any country has reason to believe that another country could be potentially harmful, then they should ask them to consult as well. Again, the ineffectiveness of this definition was seen in China essentially saying, *We didn't think creating 3,000 new pieces of orbital debris would be potentially harmful.*

Any interpretation under the Reasonable Person (RP) standard observed in American and English tort law would mark this assertion of innocence to be a complete fallacy.[69] Because treaties that America has signed onto have historically been interpreted as the "law of the land,"[70] an easy transition might be made from the language contained in Art. IX like "reason to believe" and "might

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[67] This assertion is based on the assumption that the 1972 Liability Convention dealt directly with the liabilities and ramifications that might stem from conduct performed in the scope of the OST and that the 1976 Convention on Registration of Objects Launched into Outer Space dealt directly with specific registration requirements that precede the actual launch.

[68] *Supra* note 1.

[69] Throughout American and English common law, the Reasonable Person standard asks, "What would a reasonable person do in the same of similar circumstances?" Although this seems largely as ambiguous as the OST language, there are literally tens of thousands of cases evaluating the RP standard that could help guide discussions of the RP standard in Space Torts.

[70] *See* Carlos Manuel Vázquez, *Treaties as Law of the Land: The Supremacy Clause and the Judicial Enforcement of Treaties*, 122 HARV. L. REV. 599 (2009).

be potentially harmful" to something more analogous to the RP standard currently observed in the U.S. and abroad. This transition would be a seemingly stress-free one that might facilitate the incorporation of existing international law into our own domestic law, all while retaining the strength and purpose of legions of American tort law. By introducing the more stringent RP standard into the U.S. interpretation of Art. IX domestically, the U.S. might then levy their interpretation back to the U.N. for an international reassessment of Art. IX, effectively strengthening the validity and enforcement of both simultaneously.

Another approach might be to include something a little closer to the language seen in Art. XII of the OST. When discussing potential visits to the moon, Art. XII mandates "[s]uch representatives shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited."[71] This language avoids definitional ambiguity and requires absolute reciprocity in projected actions from nation-states attempting to visit the moon. A similar mechanism could easily be implemented domestically and applied to private companies seeking to launch or intercept satellites. A successful domestic program in dealing with orbital debris effectively would no doubt spur the discussion for responsible orbital debris recovery, with the U.S. leading the way.[72]

IV. BRINGING IT ALL BACK HOME: THE TEST CASE

Presently, the U.S. should take the immediate opportunity to create and declare two documented assertions. First, the U.S. should come up with a national standard of what it considers to be "space debris." In doing so, the U.S. stands to bring about a discussion, albeit a heated one (no pun intended), that could spur an international adoption of a definitional standard that would once and for all define space debris. Second, the U.S. should step up

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[71] Outer Space Treaty, *supra* note 1, at art. 12.

[72] Although it is the opinion of the author that there are also a number of other sections of the OST, namely Art. IV and Art. VII that could be interpreted through our domestic legal system in order to provide greater clarity for what constitutes responsible space exploration and ASAT testing, this is not the focus of this paper.

and claim responsibility for objects it has clearly contributed to the pool of space debris that currently hovers over our planet. In doing so, it would no doubt expose itself to a sea of potential litigation surrounding the liabilities of such debris in orbit. However, under the Convention on International Liability for Damage Caused by Space Objects of 1972, a treaty to which the U.S. is a party, such liability probably already exists.[73] In all reality, declaring such a liability wouldn't expose to any more liability than it isalready liable for, but, instead would just serve to illustrate good-faith to the rest of the space-faring world.[74] It is important to realize that both of these tactics would only bring the U.S. into the realm of responsibility for objects that are already in space.

This conversation remains extremely important, however, in that it must be accomplished before any hope of future judicial realms of international law might be negotiated. In terms of the U.S.'s hard law vs. soft law commitment here, the stakes aren't really that high. The U.S. effectively would be trading the international "semi-hard" law seen in its current obligations to the OST and Liability Convention for a hard version of domestic law with little substantive change or impact. The direct advantage would come when the U.S. eventually attempted to levy its "best practices" hard law back against the OST and Liability Convention in order to "harden" what it expect out of the rest of the world. This tactic would allow the U.S. to be in the driver's seat to steer further "hardening sessions" concerning the OST and Liability Convention because it would illustrate a willingness from the U.S. to ratify UN treaty language as the official "law of the land." Under the Supremacy Clause of the U.S. Constitution, this seems to clearly be the case already.[75]

The implementation of international law and codes of conduct might be problematic, but a few examples have been illustrated that hopefully will make this assimilation more appealing that complete inaction. As space exploration in the U.S. becomes increasingly privatized, the U.S. government will not be able to as-

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[73] Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[74] *Supra* note 34.

[75] *Supra* note 63.

sume a backseat role in interpreting the standards of space exploration that govern private industries in space, especially if the U.S. portends to seek immunity under the FTCA. The U.S. government will have to establish regulatory committees to outline, establish, and enforce violations of such private actors if it ever hopes to maintain a shred of credibility in the eyes of its international space comrades. This set of regulatory standards will be beneficial to the market, the actors, and the nation, all while establishing an international precedent and "shining example" of what other space faring nations should strive to be. Again, this is an example of domestic hard law that could be fabricated in order to later "harden" established international treaty commitments.

The other example provided in Part III of this paper, the example of reinterpreting OST language domestically into the creation of new U.S. law, would be by far the hardest sale in the bunch. This is true for a number of reasons. Firstly, the U.S. has historically been averse to joining any treaty that includes specific binding language that governs the U.S.'s conduct.[76] This sentiment rings especially true when you begin to threaten the U.S.'s ability to adequately defend itself and thrive in its security efforts. While these ideals seem to be in almost direct conflict with the practices of the U.S. in heralding the OST and its adherence to the language of such a treaty, the case is not so opposite. In fact, the semi-ambiguous language of the OST typically weighs itself in favor of American diplomacy. This is one of the biggest reasons the U.S. ever signed onto it in the first place. These ambiguities, and several countries propensity to expose them and take advantage of them, has kind of left the U.S. standing around with its proverbial hands in its pockets when it comes to sanction or reprimand of violating countries. In fact, if the U.S. were to try to impose sanctions or international scolding on such parties, it might currently look a little more pious than it should perhaps strive to be. By incorporating well-established international legal standards into its own domestic interpretation of the OST, like those discussed in respect to the RP standard, the U.S. might just gain a more ground with its international counterparts, and subsequently be

[76] *See* Kenneth W. Abbott and Duncan Snidal, *Hard and Soft Law in International Governance*, International Organization, Vol. 54, No. 3, Legalization and World Politics, 421 (The MIT Press 2000).

able to inject a little more domestic hard law into the increasingly soft law of the OST. These diplomatic undertakings wouldn't really change the U.S.'s current commitment, but the direction the U.S. might take in being truly diplomatic by incorporating law created internationally into its own law, could produce some benefit to all parties involved in the discussion, most of all the U.S. These benefits would be easily observed domestically by the "best practices" standards the U.S. should strive to achieve applied directly to the private actors and corporations that represent it internationally and by the effect those international actors could serve to have on the rest of the spacefaring nations of the world.

CONCLUSION

The biggest question that has to always be answered when discussing the U.S.'s ability to influence international actors with its own policy remains, *How realistic is it that the U.S. will ever take foreign policy in as its own?* Before answering that question, however, remember also, that the policy tactics proposed in this paper tend to lend themselves towards narrowing the ambiguities of policy that the U.S. typically enjoys exploiting. Therefore, by adding up these grim, but important factors, it is hard to see a probable outcome in which these policies will be adopted in U.S. law. More importantly, however, it must be remembered that at this point, there aren't any other options other than to spur the conversation for international policy reform and implementation. The U.S. and the U.N. have continuously balked at numerous OST violations in the past couple of decades, and the earth's orbital environment has paid the high price. Even with all environmental and international considerations cast aside, however, it still must be realized that domestic threats will continue to plague the U.S. without reform. The U.S. has the most sophisticated and extensive network of space assets in the world and its high time it started acting like it. The U.S. enjoys a firm seat as the head of space exploration and should wield that power accordingly, with boldness and authority it possesses now; because in the end, like everything else, such power will have its season. The U.S. better utilize its seat at the head of the table that governs international space exploration standards while it still has a chance, and that ultimately means it must start now before its loaded hand has been folded.

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