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DANGER AT 700,000 FEET: WHY THE UNITED STATES NEEDS TO DEVELOP A KINETIC ANTI-SATELLITE MISSILE TECHNOLOGY TEST-BAN TREATY

The second best thing about space travel is that the distances involved make war very difficult, usually impractical, and almost always unnecessary [This] is a great boon to the intelligent man who fights only when he must—never for sport.

Robert A. Heinlein, *Time Enough For Love*, 1973.¹

Two things inspire me to awe—the starry heavens above and the moral universe within.

Attributed to Albert Einstein.²

It's too bad, but the way American people are, now that they have all this capability, instead of taking advantage of it, they'll probably just piss it all away.

President Lyndon B. Johnson, overheard during a visit to the Apollo 7 crew, 1968.³

INTRODUCTION

They called it Operation Burnt Frost.⁴ At approximately 10:26 p.m., eastern standard time, on February 20, 2008, the U.S.S. *Lake Erie* launched a single Standard Missile-3 (“SM-3”) projectile.⁵ Upon entering low-earth orbit, the SM-3 intercepted and destroyed *USA-193*, a United States spy satel-

1. DAVID M. HARLAND, *EXPLORING THE MOON: THE APOLLO EXPEDITION* 71 (1999).

2. *THE ULTIMATE QUOTABLE EINSTEIN* 474 (Alice Calaprice ed., 2011).

3. ROBERT A. HEINLEIN, *TIME ENOUGH FOR LOVE* (1973)

4. Col. Jay Raymond, *Operations Group Blazes New Trail During Operation Burnt Frost*, PETERSON AIR FORCE BASE NEWS (Mar. 11, 2008), <http://www.peterson.af.mil/news/story.asp?id=123089765>.

5. Press Release, *DoD Succeeds In Interpreting Non-Functioning Satellite*, U.S. DEPT OF DEF. (Feb. 20, 2008), <http://www.defense.gov/releases/release.aspx?releaseid=11704>.

lite that had been malfunctioning.⁶ According to the Pentagon, the missile struck the 5,000 pound satellite⁷ as it orbited at 17,000 miles-per-hour 133 nautical miles above the Earth,⁸ causing the satellite to break into thousands of pieces, each “smaller than a football.”⁹ Officials declared the kinetic anti-satellite (“ASAT”)¹⁰ operation a great success;¹¹ a Congressman even proposed a bill to officially thank the crew of the *Lake Erie*.¹²

However, the repeat of such an exercise could have drastic consequences for humanity’s outer space ambitions. Although “relatively little lasting debris was created” by the destruction of *USA-193*,¹³ experience has shown that another kinetic ASAT operation could create thousands of pieces of debris in orbit around Earth, each capable of causing serious or even catastrophic damage to other spacecraft, both manned and unmanned.¹⁴ For instance, a Chinese demonstration of their ki-

6. *U.S. Missile Hits Spy Satellite*, NEWS SCIENTIST (Feb. 21, 2008), <http://www.newscientist.com/article/dn13359-us-missile-hits-spy-satellite.html>.

7. Gerry J. Gilmore, *Navy Missile Likely Hit Fuel Tank on Disabled Satellite*, AMERICAN FORCES PRESS SERVICE (Feb. 21, 2008), <http://www.defense.gov/news/newsarticle.aspx?id=49030>.

8. Fred W. Baker III, *Gates Pleased by Mission’s Success*, AMERICAN FORCES PRESS SERVICE (Feb. 21, 2008), <http://www.defense.gov/news/newsarticle.aspx?id=49025>.

9. Press Release, *Satellite Debris Analysis Indicates Hydrazine Tank Hit*, U.S. DEP’T OF DEF. (Feb. 25, 2008), <http://www.defense.gov/releases/release.aspx?releaseid=11709>.

10. A kinetic anti-satellite weapon is one that will “destroy targets by the force of impact.” *China’s Anti-Satellite Missile Test Criticized*, FIN. TIMES (Jan. 19, 2007, 12:55 AM), <http://www.ft.com/cms/s/0/bddab382-a77a-11db-b448-0000779e2340.html#axzz1exhRqejM>.

11. *Officials Declare Satellite Mission Successful*, AMERICAN FORCES PRESS SERVICE (Feb. 25, 2008), <http://www.defense.gov/news/newsarticle.aspx?id=49066>.

12. H. R. Res. 1004, 110th Cong. (2008).

13. SPACE SECURITY 2009 at 9 (Jessica West ed., 2009), *available at* <http://www.spacesecurity.org/SSI2009.pdf>.

14. *Space Junk at Tipping Point, Says Report*, BBC NEWS (Sept. 1, 2011, 8:28 PM), <http://www.bbc.co.uk/news/world-us-canada-14757926>.

The phrase ‘space debris’ refers to all non-functional man-made space objects. There are four categories of debris: (1) inactive payloads, (2) operational debris, (3) fragmentation debris, and (4) micro-particulate debris. Inactive payloads are defunct satellites that drift through space. Operational debris includes anything released into

netic ASAT technology in January 2007 created an estimated 150,000 debris particles larger than one centimeter.¹⁵

While space is incalculably vast, the area directly around the planet Earth has grown cluttered; in fact, there are currently more than 22,000 pieces of debris in orbit that are large enough to be actively tracked,¹⁶ but that number represents only an

space during the course of a mission, such as spent rocket stages, exploding bolts, and lens caps ejected prior to camera operation. Fragmentation debris, which makes up the greatest segment of the debris population, consists of fragments born of collisions and explosions. Microparticulate debris consists largely of paint chips from deteriorating surfaces and particles created by the burning of solid rocket fuels.

Debris can also be divided into three size groups: (1) “large” objects with a diameter over ten centimeters, (2) “medium” objects with a diameter between ten centimeters and one millimeter, and (3) “small” objects less than one millimeter in diameter Smaller debris is far more numerous: tens of millions of “medium”-sized pieces of debris float in space while trillions of “small” pieces wash across the orbits like waves of sand.

Medium and small fragmentation debris is particularly dangerous because this debris typically travels much faster than large debris and can be shot in any direction by the explosive force of a collision. An individual piece of debris may reach speeds up to fifteen kilometers per second (54,000 kilometers per hour). At this speed, a fragment the size of a bullet could torpedo a space station or destroy a satellite. A much smaller fragment would easily pierce an astronaut’s suit. Even small particles traveling at a relatively low speed can over time degrade the surfaces of spacecraft components. Disturbingly, ninety-nine percent of all orbital debris is composed of this deadlier class of debris with a diameter under ten centimeters.

Mark J. Sundahl, *Unidentified Orbital Debris: The Case for A Market-Share Liability Regime*, 24 HASTINGS INT’L & COMP. L. REV. 125, 128–29 (2000) (internal citations omitted).

15. Jonathan Amos, *Space Debris: Time to clean up the sky*, BBC NEWS (Sept. 2, 2011, 7:55 AM), <http://www.bbc.co.uk/news/science-environment-14763668>.

16. *Id.* However, the United States and Russia “do not track debris smaller than ten centimeters in diameter. Therefore, the vast majority of space debris, which is composed of fragments less than ten centimeters in diameter, has been left ‘unidentified.’” Sundahl, *supra* note 14, at 133, *citing* Technical Report on Space Debris, Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, U.N. Doc. A/AC.105/720 at 5. Fewer than 5 percent of the man-made objects being tracked are operational satellites, the remainder is debris. Lieutenant Colonel Joseph S. Imburgia, *Space Debris and Its Threat to National Security: A*

estimated 10 percent of the objects in orbit.¹⁷ Each piece of debris travels at speeds up to 17,500 miles-per-hour, “fast enough for a relatively small piece of orbital debris to damage a satellite or a spacecraft.”¹⁸ “Even tiny paint flecks can damage a spacecraft when traveling at these velocities.”¹⁹ Making matters worse, the pace of the accumulation of debris in space has greatly increased in the last decade.²⁰ The “growth of this indiscriminate hazard” will restrict mankind’s use of space.²¹ “The danger is that each collision exponentially raises the potential for another, such that a debris cascade could someday render entire orbits unusable.”²² In September 2011, the Na-

Proposal for A Binding International Agreement to Clean Up the Junk, 44 VAND. J. TRANSNAT'L L. 589, 594 (2011), quoting SPACE SECURITY 2010, at 31 (Cesar Jaramillo et al., eds. 2010).

17. Video, Brink: Space Junk, DISCOVERY.COM (June 29, 2009), <http://science.discovery.com/videos/brink-package-space-junk.html> (last visited Nov. 21, 2011).

18. National Aeronautics and Space Administration, *Space Debris and Human Spacecraft*, http://www.nasa.gov/mission_pages/station/news/orbital_debris.html (last updated Oct. 23, 2010).

19. *Id.* As of 2007, the U.S. Space Shuttle’s windows required replacement “55 times because of small debris hits that caused pockmarks, but thankfully did not crack them, which could have had catastrophic consequences.” Michael Krepon, *A Code of Conduct for Responsible Space-Faring Nations*, Celebrating the Space Age: 50 Years of Space Technology 40 Years of the Outer Space Treaty, Conference Report 166 (Apr. 3, 2007), <http://www.unidir.org/pdf/articles/pdf-art2675.pdf>. For a humorous interpretation of this serious situation, see Rhett & Link, *Space Junk Song*, <http://www.youtube.com/watch?v=6Fy7psIuJjc> (uploaded July 6, 2009).

20. William J. Lynn, III, *A Military Strategy for the New Space Environment*, 34 WASH. Q. 7, 8 (2011), citing U.S. NATIONAL SECURITY SPACE STRATEGY: UNCLASSIFIED SUMMARY, U.S. DEP’T OF DEF. (January 2011), available at http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.

21. Michael Krepon & Samuel Black, *An International Code of Conduct for Responsible Spacefaring Nations*, in SPACE SAFETY REGULATIONS AND STANDARDS 243 (Joseph N. Pelton & Ram Jakhu eds., 2010).

22. William J. Lynn, III, *Defining a Military Strategy for the New Space Environment*, EARTH IMAGING JOURNAL, <http://eijournal.com/2011/defining-a-military-strategy-for-the-new-space-environment>. “Experts warn that if the cascade effect occurs, space will be unusable for centuries due to the time it will take for all of the debris to eventually disintegrate in Earth’s atmosphere.” Imburgia, *supra* note 16, at 598, citing Sundahl, *supra* note 14, at 132.

tional Research Council released a report warning that we may have reached “a tipping point, with enough [debris] currently in orbit to continually collide and create even more debris”²³ With each piece of orbital debris capable of causing serious damage,²⁴ an increase in the amount of debris in orbit will likely prove prohibitive to the basic utilization, let alone exploration, of space.²⁵

This Note argues that, in order to help slow the accumulation of space debris, the United States should endeavor to form a treaty with China, Russia, India and other space-faring nations that would ban the testing of kinetic ASAT missile systems; the use of these weapons will hinder humanity’s further use of space and other preferable technologies exist to serve as a means of national self-defense in times of war. Part I of this Note will provide a brief history of the laws applying to space-faring nations, including the Outer Space Treaty of 1967. Part II will provide a history of ASAT technology. Part III will provide a discussion of alternative methods that are available, and why those alternative methods should be used. Part IV will discuss why the time has come for the United States to enter into a test-ban treaty on the usage of kinetic ASAT technology.

I. HISTORY OF SPACE LAW

A. *Origins*

The age of human exploration of outer space dawned on October 4, 1957, when the former Soviet Union launched a beach-

23. BBC NEWS, *supra* note 14; *Space junk a ‘serious issue’*, BBC NEWS (Sept. 2, 2011, 7:15 AM), <http://www.bbc.co.uk/news/science-environment-14762620>.

24. “[A] piece of orbiting junk the size of a cherry collides with the force of an exploding grenade.” Andy Duckworth, *The destructive power of space junk – video*, GUARDIAN, Mar. 15, 2011, <http://www.guardian.co.uk/science/video/2011/mar/15/space-debris-european-space-agency>.

25. For instance, on March 12, 2009, “space debris forced astronauts aboard the International Space Station to take shelter in an escape capsule out of fear that debris would collide with the station.” Imburgia, *supra* note 16, at 591, *citing* Traci Watson, *Space Junk Forces Crew to Scram: Astronauts Enter Escape Pod in Case Debris Hit Station*, USA TODAY, Mar. 13, 2009, at 2A.

ball sized, 184 pound satellite known as Sputnik.²⁶ However, the legal exploration of space had already begun. In January of that year, Henry Cabot Lodge, Jr., the United States Ambassador to the United Nations, addressed the U.N. General Assembly and declared that the United States hoped “future development of outer space would be devoted exclusively to peaceful and scientific purposes.”²⁷ Several months later—still prior to Sputnik—Secretary of State John Foster Dulles announced the willingness of the United States to “devise a ‘system which would insure that outer space missiles would be used exclusively for peaceful and scientific purposes’ and ‘for the benefit of mankind.’”²⁸

On August 29, 1957, the United States, the United Kingdom, and France—in a joint submission to the U.N. Disarmament Commission—called for an inspection system that would ensure that “the sending of objects through outer space will be exclusively for peaceful and scientific purposes.”²⁹ A little more than two months later, on November 14, 1957, the U.N. General Assembly adopted Resolution 1148(XII), which incorporated the western powers’ proposal almost verbatim.³⁰ The next year, the U.N. General Assembly adopted Resolution 1348(XIII), “[r]ecognizing the common interest of mankind in outer space and recognizing that it is the common aim that outer space should be used for peaceful purposes only”³¹ The resolution also established the ad hoc Committee on the Peaceful Uses of Outer Space (“COPUOS”).³² In 1963, COPUOS

26. Steve Garber, *Sputnik and the Dawn of the Space Age*, <http://history.nasa.gov/sputnik/> (last visited Jan. 22, 2013).

27. Ivan A. Vlasic, *Space Law and the Military Applications of Space Technology*, in PERSPECTIVES ON INTERNATIONAL LAW 385, 390 (Nandasiri Jasentuliyana ed., 1995), quoting P. Jessup & H. Taubenfeld, CONTROLS FOR OUTER SPACE AND THE ANTARTIC ANALOGY 252 (1959).

28. Ivan A. Vlasic, *The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space*, in PEACEFUL AND NON-PEACEFUL USES OF OUTER SPACE 37, 38 (Bhupendra Jasani ed., 1991), quoting P. Jessup & H. Taubenfeld, *supra* note 27.

29. U.N. Doc. DC/SC.1/66, (Aug. 29, 1957), in *Fifth Report of the Subcommittee of the Disarmament Commission* (DC/113), Annex 5.

30. G.A. Res 1148(XII), ¶ 1(f), U.N. Doc. A/RES/1148(XII) (Nov. 14, 1957).

31. QUESTION OF THE PEACEFUL USE OF OUTER SPACE, G.A. Res. 1348 (XIII), U.N. Doc. A/RES/1348(XIII) (Dec. 13, 1958).

32. *Id.* COPUOS was made a regular committee of the General Assembly the next year in Resolution 1472(XIV). INTERNATIONAL CO-OPERATION IN THE

prepared and put forward Resolution 1962, the “Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space” (known in short as the “Principles Declaration”).³³ Unanimously adopted by the General Assembly, the Principles Declaration pronounced the General Assembly to be “[i]nspired by the great prospects opening up before mankind as a result of man’s entry into outer space”³⁴ The “Principles Declaration” played a large part in facilitating the development of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 27

PEACEFUL USES OF OUTER SPACE, G.A. Res. 1472 (XIV), U.N. Doc. A/RES/1472 (XIV) (Dec. 12, 1959).

33. U.N. INST. FOR DISARMAMENT RES., COMMON SECURITY IN OUTER SPACE AND INTERNATIONAL LAW, at 13, U.N. Sales No. GV.E.06.0.3 (2006) (by Detlev Wolter) [hereinafter Wolter, COMMON SECURITY].

34. DECLARATION OF LEGAL PRINCIPLES GOVERNING THE ACTIVITIES OF STATES IN THE EXPLORATION AND USE OF OUTER SPACE, G.A. Res. 1962 (XVIII), U.N. Doc. A/RES/1962 (XVIII) (Dec. 13, 1963) (emphasis in original). In the Principles Declaration, all member states agreed to be guided by a set of principles providing, among other things, that:

(1) The exploration and use of outer space shall be carried on for the benefit and in the interests of all mankind

(6) In the exploration and use of outer space, States shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space with due regard for the corresponding interests of other States. If a State has reason to believe that an outer space activity or experiment planned by it or its nationals would cause potentially harmful interference with activities of other States in the peaceful exploration and use of outer space, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State which has reason to believe that an outer space activity or experiment planned by another State would cause potentially harmful interference with activities in the peaceful exploration and use of outer space may request consultation concerning the activity or experiment

(8) Each State which launches or procures the launching of an object into outer space, and each State from whose territory or facility an object is launched, is internationally liable for damage to a foreign State or to its natural or juridical persons by such object or its component parts on the earth, in air space, or in outer space

Id.

January 1967 (hereinafter referred to as "The Outer Space Treaty of 1967," or simply the "OST").³⁵

B. The Outer Space Treaty of 1967

Ratified by nearly 100 countries, The Outer Space Treaty of 1967, which is "sometimes referred to as 'the Magna Carta' or the 'The Bible' of outer space law"³⁶ uses the same wording of the 'Principles Declaration' in its preamble and confirms the fundamental principles that outer space is "the province of all mankind."³⁷ Article IX, in particular provides that

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 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 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.³⁸

Article VII also provides that "Each State Party to the Treaty that launches or procures the launching of an object into outer space . . . is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by

35. Wolter, COMMON SECURITY, *supra* note 33, at 17.

36. Alexander Soucek, *International Law, in* OUTER SPACE IN SOCIETY, POLITICS AND LAW 298 (Christian Brunner & Alexander Soucek eds., 2011).

37. Wolter, COMMON SECURITY, *supra* note 33, at 19, quoting Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Treaty on Principles].

38. Treaty on Principles, art. 9.

such object or its component parts on the Earth, in air space or in outer space”³⁹

These articles may have been part of an international response to a 1963 United States space communications experiment called *Project West Ford*, in which the U.S. Air Force launched 480 million tiny copper needles⁴⁰ that gradually dispersed in space, creating a ring fifteen kilometers wide and thirty kilometers thick, encircling the globe at an altitude of around 2,300 miles.⁴¹ The Air Force believed that, if it worked, *Project West Ford* would serve as a prototype for two more permanent rings that would guarantee their ability to communicate across the globe.⁴² Although the project was technically successful (scientists on the east coast of the United States communicated with scientists on the west coast),⁴³ the scientific community fervently objected on grounds that the needles could cause “potentially harmful inference with radio astronomy, optical astronomy, space communications, and space travel.”⁴⁴ It is notable that clumps of the needles remained in orbit past the year 2000, and may still remain in space.⁴⁵

It is also noteworthy that, while the OST limits signatories to “peaceful uses” of space, it never defines the term.⁴⁶ This ambiguity becomes clear upon comparison with Section 1, Article I of the Antarctic Treaty of 1959: “Antarctica shall be used for peaceful purposes only. There shall be prohibited, *inter alia*,

39. Treaty on Principles, art. 7.

40. Each of which were 1.8 centimeters long and 0.0018 centimeters in diameter and weighed only forty micrograms. Anthony Kendall, *Earth’s Artificial Ring: Project West Ford* (May 2, 2006), <http://www.damninteresting.com/earths-artificial-ring-project-west-ford/>.

41. *Id.*

42. *Project West Ford: Brass Tacks*, HARV. CRIMSON (May 24, 1963), <http://www.thecrimson.com/article/1963/5/24/project-west-ford-pfour-hundred-million/>.

43. Andrew J. Butrica, *Beyond the Ionosphere: Fifty Years of Satellite Communication*, National Aeronautics and Space Administration, <http://history.nasa.gov/SP-4217/intro.htm> (last visited Jan. 22, 2013).

44. Michael C. Mineiro, FY-1C and USA-193 ASAT Intercepts: an Assessment of Legal Obligations under Article IX of the Outer Space Treaty, 34 J. SPACE L. 321, 327 (2008).

45. Spacecraft, *West Ford Dipoles* (Sept. 18, 2003), <http://web.archive.org/web/20070312200131/http://www.aoe.vt.edu/~cdhall/Space/archives/000289.html>.

46. Treaty on Principles, *supra* note 37.

any measure of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapon.”⁴⁷ The OST’s vagueness allows for interpretations that permit military activities that can be defined as non-aggressive and/or defensive; in fact, “except for the stationing of nuclear weapons and [other] weapons of mass destruction, all other forms of military activity are permitted in outer space.”⁴⁸ Such an interpretation is embodied in the most recent declaration of the United States’ national space policy, which states:

The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, defend our space systems and contribute to the defense of allied space systems, and, if deterrence fails, defeat efforts to attack them.⁴⁹

In fact, the Americans have been accused of being the reason behind the ambiguity.⁵⁰ According to former COPUOS chairman Peter Jankowitsch, the American government considered military “support activities,” such as using satellites for reconnaissance, navigation, and surveillance, to be part of the framework for its strategy of nuclear deterrence.⁵¹ Given its recent national space policy, it seems very likely that the

47. The Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71. See S. Chandrashekar, *Problems of Definition: A View of an Emerging Space Power*, in PEACEFUL AND NON-PEACEFUL USES OF OUTER SPACE 77, 81 (Bhupendra Jasani ed., 1991).

48. Chandrashekar, *supra* note 47. According to Alexander Yakovenko, official spokesperson for the Russian Foreign Ministry, as of July 3, 2002, “the 1967 Outer Space Treaty did ban placing all the kinds of [weapons of mass destruction] in space and on celestial bodies, but today there are no legal barriers whatsoever to the placement in orbit around the Earth of any other weapons.” News Review, *Russia and China Introduce Draft Treaty on Space Weapons*, DISARMAMENT DIPLOMACY (Sept. 2002), available at <http://www.acronym.org.uk/dd/dd66/66nr07.htm>.

49. National Space Policy of the United States of America, June 28, 2010, at http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf.

50. Wolter, COMMON SECURITY, *supra* note 33, quoting P. Jankowitsch, *From Cold War to Detente in Outer Space: The Role of the United Nations in Outer Space Law Development*, in PROCEEDINGS FROM THE 40TH COLLOQUIUM ON THE LAW OF OUTER SPACE 45 (1998).

51. *Id.*

American government, if not other governments as well, would object to a total ban—similar to that of the Antarctic Treaty—on military usage of outer space.⁵²

C. *The Liability Convention of 1972*

In making COPUOS a regular committee of the General Assembly, Resolution 1472(XIV) mandated that COPUOS needed “[t]o study the nature of legal problems which may arise from the exploration of outer space.”⁵³ Pursuant to that mandate, in 1962, COPUOS established a special legal subcommittee to examine the legal implications of space activities.⁵⁴ Soon, the legal subcommittee began encountering legal problems that the OST’s signatories had not initially anticipated. One such issue came to light on June 5, 1969, when fragments of a device launched into outer space struck a Japanese cargo ship off the coast of Siberia, causing damage to the ship and injuring five sailors.⁵⁵ Following this incident, Belgium, Hungary, India, and Italy submitted to COPUOS drafts for a convention on liability.⁵⁶ On November 29, 1971, the U.N. General Assembly adopted the Liability Convention,⁵⁷ and it entered into force in September 1972.⁵⁸

Elaborating on the Outer Space Treaty, the Liability Convention provides that a “launching State shall be absolutely liable to pay compensation for damage caused by its space object on

52. The United States has previously declared that it would be unwilling to negotiate a treaty prohibiting space weapons. Union of Concerned Scientists, *International Legal Agreements Relevant to Space Weapons* (Feb. 2004), http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/policy_issues/international-legal.html.

53. G.A. Res. 1472 (XIV), *supra* note 32.

54. I.H. PH. DIEDERIKS-VERSCHOOR & V. KOPAL, AN INTRODUCTION TO SPACE LAW 34 (3d ed. 2008).

55. *Id.* at 35, *citing* Summary Record of the One Hundred and Thirty-First (Closing) Meeting of the Convention on International Liability for Damage Caused by Space Objects, U.N. Doc. A/AC.105/C.2/SR.131 at 5-6.

56. *Id.*

57. *Id.* G.A. Res 2777, U.N. Doc. A/RES/2777 (Nov. 29, 1971).

58. United Nations Office for Outer Space Affairs, Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 10 I.L.M. 965 [hereinafter Liability Convention]. “As of October 1, 2010, the Liability Convention had ninety ratifications and twenty-three signatures. North Korea is a nonparty, but ratifications include the United States, Russia, China, and even Iran.” Imburgia, *supra* note 16, at 616, *citing* Liability Convention.

the surface of the earth or to aircraft flight” and liable for damage in space due to its faults, “or fault of persons for whom it is responsible.”⁵⁹ The convention also states that “[n]o exoneration whatever shall be granted” when the damage is caused by activities that fail to conform to the standards provided by international law including, in particular, the OST.⁶⁰ Scholars have called the Liability Convention “the most relevant space law treaty regarding space debris.”⁶¹

D. The Registration Convention of 1975

COPUOS soon discovered that “a mandatory system of registering objects launched into outer space would, in particular, assist in their identification and would contribute to the application and development of international law governing the exploration and use of outer space”⁶² Registration of objects launched into space serves two important functions in preserving the peaceful use of outer space: “(1) it is not possible to identify [the source of a damaging object] without a system of registration; [and] (2) a well-ordered, complete and informative system of registration would minimize the likelihood and even the suspicion of weapons” being put into space.⁶³ Recognizing this, COPUOS put forth the Registration Convention, which

59. G.A. Res 2777, *supra* note 57.

60. *Id.*

61. See, e.g. Irene Atney-Yuridin, *Space Debris Legal Research Guide*, 3 PACE Y.B. INT'L L. 167, 182 (1991). For instance, under the Liability Convention, multiple attempts have been made by nations to recover for damages caused by space debris. See Joseph A. Burke, *Convention on International Liability for Damage Caused by Space Objects: Definition and Determination of Damages After the Cosmos 954 Incident*, 8 FORDHAM INT'L L.J., 255, 273 (1984) (discussing the Canadian attempt to recover from the Soviet Union after the destruction of a Soviet satellite, *Cosmos 954*, caused nuclear debris to land in Canadian Northwest Territories); Hannah Siemer, *Littering Fine Paid*, ESPERANCE EXPRESS (Apr. 17, 2009), <http://www.esperanceexpress.com.au/news/local/news/general/littering-fine-paid/1488319.aspx> (discussing Australian recovery for the clean-up of pieces of the American space-station Skylab, which disintegrated over Australia); cf. Gunnar Leinberg, *Orbital Space Debris*, 4 J.L. & TECH. 93, 103 (1989) (“The [Liability Convention] is very useful in situations where damage has occurred, but is not very helpful in the prevention or control of orbital space debris.”).

62. Convention on the Registration of Objects Launched into Outer Space, G.A. Res. 3235 (XXIX), U.N. Doc. A/RES/3235 (Nov. 12, 1974).

63. Diederiks-Verschoor & Kopal, *supra* note 54, at 44.

was adopted by the U.N. General Assembly without a vote on November 12, 1974, opened for signature on January 14, 1975, and entered into force on September 15, 1976.⁶⁴ Article IV of the Convention requires that all launching States contact the Secretary-General of the U.N. and inform him of the “(a) name of launching State or States; (b) . . . appropriate designator of the space object or its registration number; (c) date and territory or location of launch; (d) basic orbital parameters . . . [, and] (e) general function of the space object.”⁶⁵ Despite the requirement for disclosure of the general function of the satellite, alternate—or ulterior—purposes or functions need not be disclosed.⁶⁶

E. 2007 Nonbinding Space Debris Mitigation Guidelines

On February 1, 2008, the U.N. General Assembly adopted Resolution 62/217, which endorsed COPUOS’s Space Debris Mitigation Guidelines.⁶⁷ The General Assembly agreed that the

64. *Id.* “As of October 1, 2010, [the Registration Convention] had been ratified by fifty-four states, including the United States, Russia, China, and even North Korea. Four countries, including Iran, have signed but not ratified the Registration Convention.” Imburgia, *supra* note 16, at 618 (internal citations omitted), *citing* Convention on Registration of Objects Launched into Outer Space, U.N. Office Outer Space Aff., <http://www.oosa.unvienna.org/oosa/SORegister/index.html> (last visited Nov. 20, 2011). Additionally, “two international intergovernmental organizations (the European Space Agency and the European Organization for the Exploitation of Meteorological Satellites) have declared their acceptance of the rights and obligations provided for in the Convention.” *Id.* at 618 n.237.

65. Convention on the Registration of Objects Launched into Outer Space, G.A. Res. 3235 (XXIX), U.N. Doc. A/RES/3235 (Nov. 12, 1974).

66. *See* Diederiks-Verschoor & Kopal, *supra* note 54, at 45 (“The main problem emanating from [the Registration Convention] lies in the unwillingness of states to disclose that they have launched satellites for military purposes, or their real missions. Even when only the slightest indication about the object’s general purpose is asked, states are often unwilling to provide such information.”).

67. International cooperation in the peaceful uses of outer space, G.A. Res. 62/217 (LXII), U.N. Doc. A/RES/63/90, (Feb. 1, 2008). COPUOS had provided the U.N. General Assembly with the following seven nonbinding guidelines for the mitigation of space debris:

Guideline 1: Limit debris released during normal operations;

Guideline 2: Minimize the potential for break-ups during operational phases;

guidelines would be voluntary, although they also reflected “the existing practices as developed by a number of national and international organizations, and invited Member States to implement those guidelines through relevant national mechanisms.”⁶⁸

However, because the guidelines reflect already “existing practices,”⁶⁹ and are nonbinding in nature, they are effectively toothless.⁷⁰ While nonbinding agreements can become binding customary law through continued usage, that is unlikely to be the case with space debris.⁷¹ Further action is required.

Guideline 3: Limit the probability of accidental collision in orbit;

Guideline 4: Avoid intentional destruction and other harmful activities;

Guideline 5: Minimize potential for post-mission break-ups resulting from stored energy;

Guideline 6: Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region after the end of their mission; and

Guideline 7: Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission.

Imburgia, *supra* note 16, at 623-24.

68. G.A. Res. 62/217 (LXII), *supra* note 67.

69. *Id.*

70. See Imburgia, *supra* note 16, at 624-25.

71. *Id.* at 625.

Customary international law on space debris is never likely to develop. The first problem is that the prevailing, but not universal, state practice among the specially affected states is to limit the creation of new orbital debris when it is cost-effective and can be accomplished without negative mission impact. Since the space race began, states abandoned satellites in space and made no effort to minimize the creation of new debris. Incidents such as [*FY-1C*], and [*USA-193*], provide additional evidence that consistent state practice has not yet solidified regarding space debris mitigation, and even if it has, states do not feel obligated to follow that practice.

Id. (internal quotations and citations omitted).

II. HISTORY OF ASAT SYSTEMS

Within two years of *Sputnik*, the United States military began to conduct ASAT missile technology testing.⁷² On September 22, 1959, the U.S. Air Force launched a missile from a jet at 35,000 feet in an attempt to intercept the *Explorer V* satellite.⁷³ Another test was conducted three weeks later, on October 13, that “successfully passed within 6.4 km (4 miles) of” *Explorer VI*.⁷⁴ Other early U.S. tests, which continued until 1970, “involved components of systems that would have relied on nuclear detonations to destroy their targets.”⁷⁵ “The Soviet Union began research into ASAT systems around 1960 and first tested prototype components in 1967. Moscow then conducted seven ASAT tests between 1968 and 1971, and an additional 13 tests from 1976 to 1982.”⁷⁶ In 1976, renewed Soviet ASAT testing led the United States to develop a kinetic-energy ASAT missile launched from an F-15 fighter.⁷⁷

Around this time, the Carter Administration attempted negotiations to address anti-satellite warfare. President Carter declared that “verifiable, comprehensive limits on antisatellite capabilities’ were in the U.S. national security interest”⁷⁸ However, these negotiations failed in large part due to the United States’ use of the Space Shuttle. The Soviets feared that the Space Shuttle’s arm gave it capability to capture a satellite, stow it in the shuttle’s cargo bay, and take it back to Earth.⁷⁹ Negotiations also broke-down over a failure to agree on what constituted a space weapon.⁸⁰ ASAT testing continued.

72. See Andreas Parsch, *Directory of U.S. Military Rockets and Missiles*, <http://designation-systems.net/dusrm/app4/ws-199.html>.

73. *Id.*

74. *Id.*

75. Ross Liemer & Christopher F. Chyba, *A Verifiable Limited Test Ban for Anti-Satellite Weapons*, WASH. Q. 149, 152 (July 2010). Andrew T. Park, *Incremental Steps for Achieving Space Security: The Need for A New Way of Thinking to Enhance the Legal Regime for Space*, 28 HOUS. J. INT’L L. 871, 877 (2006), citing Michael Krepon & Christopher Clary, *Space Assurance or Space Dominance?: The Case Against Weaponizing Space*, THE HENRY L. STIMSON CENTER, 94 (2003), <http://www.stimson.org/images/uploads/research-pdfs/spacebook.pdf> (last visited Dec. 22, 2011).

76. Liemer & Chyba, *supra* note 75.

77. *Id.*

78. Krepon & Clary, *supra* note 75, at 6.

79. Krepon, *supra* note 19, at 168.

80. For instance, see Krepon, *supra* note 19, at 168:

As Ross Liemer and Christopher Chyba noted “[b]etween 1984 and 1986, the United States conducted five tests of the F-15 ASAT missile launching system, only one of which damaged a satellite.”⁸¹ They go on to add that “[i]n September 1985, the Air Force crashed an ASAT homing vehicle into Solwind P78-1, a solar research satellite, at an altitude of 525 km.”⁸² The impact created 285 pieces of debris large enough to be tracked, most of which fell out of orbit within a decade.⁸³ Ironically, the United States’ successful interception of the *Solwind*, which was done in response to Soviet testing, came after Soviet leader Yuri Andropov announced a unilateral moratorium on ASAT tests in 1983, much to the dismay of the Soviet military establishment.⁸⁴

Following the *Solwind* interception, no significant anti-satellite testing occurred for twenty years.⁸⁵ Both the United

First and foremost, a treaty banning space weapons requires an agreed definition of space weapons. What is it that we seek to ban? Many things can be used as space weapons. As noted above, marbles could be tested, deployed and used as space weapons. Do we ban marbles? Jamming devices can be used as space weapons. Many countries have jammers. Do we ban jammers? Lasers can be used as space weapons. But lasers can also be used as space tracking, range finding, intelligence collection or communication devices. Do we ban lasers?

81. Liemer & Chyba, *supra* note 75, at 152.

82. *Id.* The Union of Concerned Scientists and four Democratic members of the House of Representatives—George E. Brown Jr. of California, Joe Moakley of Massachusetts, Matthew F. McHugh of New York, and John F. Seiberling of Ohio—attempted to seek an injunction in federal court to prevent the *Solwind* interception. However, “District Court Judge Norma Johnson denied the motion, partly on the grounds that she viewed the issue as a ‘political question’ between the legislative and executive branches of Government in which the court should not intervene.” See *Judge Won’t Bar Test Firing At Satellite, Expected Today*, N.Y. TIMES, Sept. 13, 1985, at A8.

83. The last piece fell back to Earth in 2004. Liemer & Chyba, *supra* note 75, at 152.

84. See Anatoly Zak, *Spacecraft: Military: IS anti-satellite system*, Russian Space Web, <http://www.russianspaceweb.com/is.html> (last visited Jan. 23, 2013).

85. See David A. Koplow, *ASAT-Isfaction: Customary International Law and the Regulation of Anti-Satellite Weapons*, 30 MICH. J. INT’L L. 1187, 1209–1210 (2009) [hereinafter Koplow, ASAT]. See also, Brendan Nicholson, *World Fury at satellite destruction*, THE AGE, (Jan. 20, 2007), <http://www.theage.com.au/news/national/fury-at-space-destruction/2007/01/19/1169095981210.html> (*FY-1C* is “is the world’s first

States and the Soviet Union/Russia claimed to have ceased testing out of concerns that the debris resulting from the testing could harm civilian and military satellite operations.⁸⁶

However, at 5:28 p.m., eastern standard time, on January 11, 2007, China shattered the silence with their own successful missile test.⁸⁷ The characteristics of the test indicated a clear intent to demonstrate the power of the Chinese military.⁸⁸ The interception and destruction of the *Feng Yun 1C (FY-1C)* meteorological satellite occurred at an altitude “consistent with the operational altitudes of American and Japanese imagery intelligence satellites.”⁸⁹ Despite having knowledge of China’s aspirations, including knowledge of two previous tests,⁹⁰ the successful test still caused “shock” in United States high military command.⁹¹

[ASAT test] since the 1980s.”). Although no significant testing occurred, ASAT technology continued to receive large amounts of funding. Koplow, ASAT at 1209. Soviet ASAT funding continued into 1991. Anatoly Zak, *supra* note 84.

86. See *China confirms satellite downed*, BBC NEWS (Jan. 23, 2007, 10:52 AM), <http://news.bbc.co.uk/2/hi/asia-pacific/6289519.stm>.

87. See *Chinese Anti-Satellite [ASAT] Capabilities and ABM Capability*, GLOBALSECURITY.ORG, <http://www.globalsecurity.org/space/world/china/asat.htm> (last visited Jan. 23, 2013).

88. “It is hard to see the test other than as a display of China’s ability to challenge American space power.” *Stormy Weather: China and Space*, ECON., Jan. 27, 2007, at 42. According to Jeffrey Kueter, president of the George C. Marshall Institute, an American nonprofit space and defense think tank in Washington, the destruction of *FY-1C* was the Chinese government “saying they can hold our space-based, war-fighting capability at risk, and are putting into doubt our ability to challenge them.” Michael Krepon, president emeritus of the Henry L. Stimson Center, another nonprofit involved with security issues in Washington, which has proposed a Code of Conduct that would ban the testing of kinetic ASAT technology, declared, “The Chinese are telling the Pentagon that they don’t own space.” Marc Kaufman & Dafna Linzer, *China Criticized for Anti-Satellite Missile Test Destruction of an Aging Satellite Illustrates Vulnerability of U.S. Space Assets*, WASH. POST, Jan. 19, 2007, at A01. “Why should a country so insistent that its rise threatens no-one stage such an open display of its ability to challenge American power in space?” *China: Space Invaders*, ECONOMIST (Jan. 22, 2007), <http://www.economist.com/node/8579371>.

89. GLOBALSECURITY.ORG, *supra* note 87.

90. These tests drew significantly less attention and were not made public because they were unsuccessful. *Id.*

91. Michael R. Gordon & David S. Cloud, *U.S. Knew of China’s Missile Test, but Kept Silent*, N.Y. TIMES, Apr. 23, 2007, at A1.

Despite the “fury” and “condemnation” that the international community leveled at the Chinese,⁹² the American military would echo the test a year later in *Operation Burnt Frost*.⁹³ While the American government claimed that the only purpose for shooting down *USA-193* was that the 450 kilogram fuel tank could land in a populated area and release toxic gas,⁹⁴ the international community remained skeptical of that rationale.⁹⁵ The American media even joined in on questioning the government’s claim that *USA-193* was being shot down only because of its fuel tank.⁹⁶

Interestingly, days before *USA-193*’s destruction, China announced, at a disarmament conference in Geneva, Switzerland, that it had joined with Russia to propose a treaty that “would prohibit the deployment of weapons in space and the use or threat of force against satellites or other craft.”⁹⁷ The Chinese “accused Washington of hypocrisy for criticising other countries’ space ambitions while rejecting . . . [the Sino-Russian

92. See Nicholson, *supra* note 85.

93. The Russian military has also resumed its development of ASAT technology. Michail Fomichev, *Russian officer says developing new weapon for space defense*, RIANOVOSTI (May 15, 2010, 3:11 PM), <http://en.rian.ru/russia/20100515/159029349.html>.

94. NEWSSCIENTIST, *supra* note 6.

95. See, e.g., *US spy satellite plan ‘a cover’*, BBC NEWS (Feb. 17, 2008), <http://news.bbc.co.uk/2/hi/americas/7248995.stm>.

96. Some of the media attention tended toward the humorous. “Let’s think about this for a minute. If you were, say, sitting on the porch reading the newspaper when a satellite plummeted into the backyard, emitting foul-smelling fumes, what are the chances you’d decide to stay very close to it and inhale a lot of it?” Gail Collins, Op-Ed., *Look, Up in the Sky!*, N.Y. TIMES, Feb. 21, 2008, at A23.

97. News Review, *Russia and China Introduce Draft Treaty on Space Weapons*, *supra* note 48. The Sino-Russian treaty likely echoed the treaty proposed in 2002, which

would bind states parties to three basic obligations: 1) “Not to place in orbit around the Earth any objects carrying any kinds of weapons, not to install such weapons on celestial bodies, or not to station such weapons in outer space in any other manner”; 2) “Not to resort to the threat or use of force against outer space objects”; 3) “Not to assist or encourage other states, groups of states, international organizations to participate in activities prohibited by this Treaty.”

Id.

treaty] to ban weapons in space and firing the missile at [USA-193].”⁹⁸

While the American government did not overtly respond to the criticism, it has made overtures towards entering into a separate ASAT-usage-ban pact.⁹⁹ On January 27, 2011, the *Washington Times* reported that the Obama Administration had entered into negotiations with the European Union to sign onto their Code of Conduct for Outer Space Activities (“EU Code”).¹⁰⁰

A draft of the code of conduct dated Sept. 27 says countries that sign on to the document vow to “refrain from any action which intends to bring about, directly or indirectly, damage or destruction of outer space objects unless such action is conducted to reduce the creation of outer space debris and/or is justified by the inherent right of individual or collective self-defense in accordance with the United Nations Charter or imperative safety considerations.”¹⁰¹

Conservative critics decried the negotiations, condemning them as surrendering too much power to the Chinese and other states that had not signed onto the EU Code—the Chinese government “declined offers to discuss the issue.”¹⁰² In January 2012, the United States announced that “in lieu of signing the EU code, it would work with the European Union to develop an International Code of Conduct for Outer Space Activities.”¹⁰³

98. NEWSIDENTIST, *supra* note 6.

99. See Eli Lake, *U.S., EU Eye Anti-Satellite Weapons Pact*, WASH. TIMES (Jan. 27, 2011), <http://www.washingtontimes.com/news/2011/jan/27/us-eu-eye-anti-satellite-weapons-pact/?page=all>.

100. *Id.*

101. *Id.* One critic went so far as to compare the American talks with the EU to the Chamberlin governments Munich Conference with Hitler in 1939. James Burgos, Comment to Eli Lake, *U.S., EU eye anti-satellite weapons pact*, WASH. TIMES (Jan. 27, 2011), <http://www.washingtontimes.com/news/2011/jan/27/us-eu-eye-anti-satellite-weapons-pact/?page=all>.

102. See Omri Ceren, Op-Ed, *Obama’s New Anti-Satellite Weapons Push to Cede Space to the Chinese?*, COMMENTARY (Jan. 28, 2011, 4:12 PM), <http://www.commentarymagazine.com/2011/01/28/obamas-new-anti-satellite-weapons-push-to-cede-space-to-the-chinese/>; Lake, *supra* note 99.

103. *A History of Anti-Satellite Programs*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/policy_issues/a-history-of-anti-satellite.html (last updated Feb. 16, 2012).

The international community could also adopt another proposal, such as the Henry L. Stimson Center's Code of Conduct,¹⁰⁴ which was written by the American think-tank "working with a group of non-government experts from China, Russia, Canada, France and Japan."¹⁰⁵ However, it may be years before such an agreement is settled upon and, by the time such an agreement is in place, enough debris may have accumulated that it would be too late.¹⁰⁶ Action must be taken now to prevent what is called the "Kessler syndrome," named after the NASA scientist who, in 1978, established a theory "in which fragments hit other fragments which in turn hit more, creating a cloud of debris that will make vast swathes of low-Earth orbit completely unusable."¹⁰⁷ In fact, it may already be too late; scientists believe the Kessler syndrome may still occur "even in the absence of new spacecraft launches or ASAT tests."¹⁰⁸

III. ALTERNATIVE METHODS

Several preferable anti-satellite technologies exist with the ability to replace the current kinetic ASAT technology. These non-physical technologies include laser, microwave, radio frequency, and electronic weapons; all of which present viable methods of self-defense without significantly increasing the amount of debris in orbit.¹⁰⁹ Each of these ASAT technologies have already been deployed or heavily researched and therefore present viable alternatives to kinetic ASAT technology.

104. Michael Krepon, *Space: A Code of Conduct*, HENRY L. STIMSON CENTER (2008), http://www.stimson.org/images/uploads/research-pdfs/MKrepon_Final_Format.pdf.

105. *A New Arms Race in Space?*, ECONOMIST (Jan. 25, 2007), http://www.economist.com/node/8592950?story_id=8592950.

106. See BBC NEWS, *supra* note 14.

107. Jason Palmer, *Space junk could be tackled by housekeeping spacecraft*, BBC NEWS (Aug. 8, 2011), <http://www.bbc.co.uk/news/science-environment-14405118>. Donald J. Kessler & Burton G. Cour-Palais, *Collision Frequency of Artificial Satellites: the Creation of a Debris Belt*, 83 J. GEOPHYSICAL RES. 2637-46 (June 1, 1978).

108. Ross Liemer & Christopher F. Chyba, *supra* note 75, at 155.

109. While all of the following technologies will disable an affected satellite, the effects are not always permanent. However, even a permanently disabled satellite is preferable as it constitutes a single, large, observable piece of debris rather than thousands of tiny pieces.

A. Laser Weapon Technology

Laser weapon technology functions by generating intense beams of light that can focus on distant targets.¹¹⁰ Multiple types of offensive lasers are reportedly being developed by China, Russia, and the United States.¹¹¹

Low-power lasers are typically designed to spoof or jam satellite electro-optical sensors using laser radiation . . . temporarily blinding the satellite. High-power lasers can permanently damage or destroy a satellite by radiating enough energy to overheat its parts. The satellite systems which are susceptible to high-power lasers include satellite structures, thermal control surfaces and solar panels.¹¹²

Lasers' ability to temporarily "blind" a satellite by focusing on its optical sensors, causing the satellite to see only the laser beam, have been proven; the Chinese have, for several years, attempted to disable American spy satellites using laser technology.¹¹³ Laser weapon systems are also capable of being attached to airplanes, allowing a mobile weapon capable of attacking both missiles and satellites.¹¹⁴ Currently, offensive la-

110. Tom Wilson, *Threats to United States Space Capabilities*, <http://www.fas.org/spp/eprint/article05.html#rft54> (last visited Jan. 23, 2013). "Laser systems, including coherent radiation, aligned waveform, and other devices operating at or near the optical wavelengths, operate by delivering energy onto the surface of the target. The gradual or rapid absorption of this energy leads to several forms of thermal damage for weapons application." *Id.*

111. Desmond Ball, *Assessing China's ASAT program*, NAUTILUS INSTITUTE FOR SEC. AND SUSTAINABILITY, <http://nautilus.org/apsnet/assessing-chinas-asat-program/> (last visited Jan. 23, 2013).

112. Wilson, *supra* note 110.

113. Francis Harris, *Beijing Secretly Fires Lasers to Disable US Satellites*, TELEGRAPH (Sept. 26, 2006), <http://www.telegraph.co.uk/news/worldnews/1529864/Beijing-secretly-fires-lasers-to-disable-US-satellites.html>; *Chinese Anti-Satellite Laser*, STRATEGYPAGE.COM (Sept. 26, 2006), <http://www.strategypage.com/htmwhospace/articles/20060926.aspx>; *see* GLOBALSECURITY.ORG, *supra* note 86.

114. Maj. Timothy J. Lincoln, *Directed Energy Weapons: Do We Have a Game Plan?* (2004) (unpublished monograph, School of Advanced Military Studies), *available at* <http://www.comw.org/rma/fulltext/0406lincoln.pdf>; REPORT: DEFENSE SCIENCE BOARD TASK FORCE ON DIRECTED ENERGY WEAPONS, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS 15–16 (Dec. 2007), *available at* <http://www.acq.osd.mil/dsb/reports/ADA476320.pdf>.

ser technology is being developed by Boeing, Lockheed Martin, and Northrop Grumman.¹¹⁵

B. Radio Frequency Weapons

Radio Frequency (“RF”) ASAT weapons concepts include ground-and-space-based RF emitters that fire an intense burst of radio energy at a satellite, which disables its electronic components.¹¹⁶ RF weapons are usually divided into two categories: high power microwave (“HPM”) weapons and ultrawideband (“UWB” or “video pulse”) weapons.¹¹⁷ These weapons “produce

115. *Space Weapons and Missile Defence Technology*, REACHING CRITICAL WILL, <http://www.reachingcriticalwill.org/resources/publications-and-research/research-projects/6204-space-weapons-and-missile-defence-technology> (last visited Jan. 23, 2013).

116. Wilson, *supra* note 110.

117. *Id.*

UWB weapons would generate RF radiation covering a wide frequency spectrum—nominally from about 100 MHz to more than 1 GHz—with limited directivity. Because of the UWB weapon’s low-energy spectral density and directivity, permanent damage to electronic components would be very difficult to achieve, except at very short ranges. The UWB couples through the satellite’s antenna at its receive frequency, as well as through openings in the systems shielding. If enough power is applied, the received radiation may cause major damage to the satellite’s internal communications hardware such as RF amplifiers, downconverters, or other devices on the front-end of the receiver. However, in many cases, UWB weapons may cause system upset, which may persist only while the target is being irradiated, or may require operator intervention to return the satellite to its nominal functioning state.

HPM weapons would generate an RF beam at a very narrow frequency band, in the 100 MHz to 100 GHz range, with higher directivity. The HPM devices operate by penetrating through antennas or into the interior of the target through cracks, apertures, or seams with longer wavelength radiation. The penetrating radiation causes damage or disruption as it is absorbed by internal electronic components. Unlike traditional electronic warfare, the induced electrical energy does not need to be collected by a receiver in-band and made to look precisely like a train of specific input signals. Rather, UWB and HPM can produce so-called backdoor effects that arise from overwhelming circuits with induced signals and high power transients that penetrate system’s openings or cracks. It is difficult to close off these paths in a real system, since features such as openings and electrical wiring are essential to system operation. Since disruption and upset require induction of only a few volts at the extremely low

an effect quite similar to an exoatmospheric nuclear blast resulting in upset, disruption, or burnout of the electronic components within the targeted systems.”¹¹⁸ This effect “could be used to disrupt electro-optical sensors and onboard electronics of elements of surveillance and reconnaissance systems.”¹¹⁹ In theory, RF and microwave weapons can attack large areas and groups of targets, inflicting a “more subtle damage on electronic components” than laser weapons, with an additional benefit of being “largely unaffected by clouds,” a downside of laser weapons.¹²⁰ In the 2007 fiscal year, the United States Armed Forces spent nearly forty-seven billion dollars researching RF and microwave weapons.¹²¹

C. Electronic Weapons

While an electronic attack is defined as “any action involving the use of electromagnetic energy and directed energy to control the electromagnetic spectrum or to attack an adversary,”¹²² this Note focuses only on the jamming and spoofing of satellite signals. A satellite’s signal can be disrupted with an intense competing signal causing the original signal to become “jammed.”¹²³ The signal to the satellite can also be changed with incorrect information replacing the correct information, a process called “spoofing.”¹²⁴ All military and commercial satellite communications systems are susceptible to jamming or spoofing.¹²⁵ In either case, the offending party must operate in the same radio band as the system being jammed.¹²⁶ Common commercial satellite ground communications equipment pos-

current levels of modern electronics, the power levels needed to achieve these effects can be fairly moderate, and the matching of signal waveforms can be quite imprecise.

Id.

118. Lincoln, *supra* note 114, at 50.

119. REPORT: DEFENSE SCIENCE BOARD TASK FORCE ON DIRECTED ENERGY WEAPONS, *supra* note 114, at 41.

120. Wilson, *supra* note 110.

121. REPORT: DEFENSE SCIENCE BOARD TASK FORCE ON DIRECTED ENERGY WEAPONS, *supra* note 114, at 38.

122. Wilson, *supra* note 110.

123. Gil Marshall, *Anti-Satellite Weapons (ASATS)*, <http://www.space4peace.org/asat/asat.htm> (last visited Jan. 23, 2013).

124. *Id.*

125. Wilson, *supra* note 110.

126. *Id.*

sess electronic jamming capabilities that can—and have been used to—disrupt the functions of some satellites.¹²⁷ “The threshold for using these weapons has been lowered, with a number of nations employing them for political purposes in peacetime or during crises.”¹²⁸ While military satellites frequently employ tactics such as encryption and “frequency hopping” to prevent jamming, the militaries are increasingly relying on commercial satellites for communication.¹²⁹ The United States Air Force currently has a satellite jamming system built by Northrop Grumman in 2004.¹³⁰

IV. CALL TO ACTION

The time has come for the United States to take leadership in the creation of a kinetic ASAT test-ban-treaty in order to protect mankind’s use of outer space, which has become vital to our way of life. In the words of the U.S. Department of Defense and the U.S. Intelligence Community’s 2011 National Security Space Strategy, the “current and future strategic environment

127. *Id.* To use a famous example, on April 27, 1986, John MacDougall, a.k.a. “Captain Midnight,” a part-time engineer working at a satellite dish in Central Florida, spoofed transmissions from the Galaxy 1 communications satellite for over four and a half minutes in protest over the pricing increases by the HBO Corporation, who used that satellite. Paul McNamara, *Captain Midnight: ‘No Regrets’ About Jamming HBO Back In ‘86*, NETWORK WORLD (Apr. 26, 2011, 9:41 AM), <http://www.networkworld.com/community/blog/captain-midnight-has-no-regrets-about-jamming>.

128. Lynn, *supra* note 20, at 8. For instance, in late 2011, Iran engaged in the jamming of television coverage of political unrest in Egypt. Press Release, BBC, *Iran Jamming BBC Persian Television* (Nov. 2, 2011), http://www.bbc.co.uk/pressoffice/pressreleases/stories/2011/02_february/11/persian.shtml. According to Jeffrey Kueter, satellite jamming happens “more regularly than we would like.” Patrick Temple-West, *Spy Satellite Interception Tests U.S. National Security Presence In Space*, MEDILL REPORTS (Mar. 6, 2008), *available at* <http://news.medill.northwestern.edu/washington/news.aspx?id=80751>.

129. David Shiga, *Mysterious Source Jams Satellite Communications*, NEWSSCIENTIST (Jan. 26, 2007, 11:45 AM), <http://www.newscientist.com/article/dn11033-mysterious-source-jams-satellite-communications.html>.

130. *U.S. Satellite Jamming System*, SPYFLIGHT.CO.UK, *available at* <http://www.spyflight.co.uk/sat%20jam.htm> (last visited Jan. 23, 2013).

is driven by three trends—space is becoming increasingly *congested, contested, and competitive*.¹³¹

Space has become increasingly congested. There are currently approximately 1106 operating satellites orbiting the Earth.¹³² Over the past decade, the number of satellite launches has averaged seventy-six per year, with activity intended to increase by 50 percent in the coming decade.¹³³ This congestion was highlighted in 2009 with the first accidental collision of satellites¹³⁴ creating “a significant amount of debris in what was already the most crowded region of Earth orbit.”¹³⁵ That collision, combined with the Chinese destruction of *FY-1C*, has contributed greatly to the nearly 22,000 man-made objects in orbit that are currently being tracked by the United States Department of Defense.¹³⁶ There are possibly hundreds of thousands of additional pieces of debris that are too small to track, all of which carry the capability to damage operational satellites in orbit.¹³⁷

At the same time, space has become increasingly contested and competitive. More than sixty nations and “government

131. UNCLASSIFIED SUMMARY NATIONAL SECURITY SPACE STRATEGY, DEPARTMENT OF DEFENSE, OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE 1 (Jan. 2011), *available at* http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.

132. *UCS Satellite Database*, UNION OF CONCERNED SCIENTISTS (June 12, 2012), http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/technical_issues/ucs-satellite-database.html. Approximately 443, or about 43%, of the operating satellites are operated by the United States. This is about four times greater than the number of satellites operated by Russia, with 110, or China, with 120. *Id.*

133. Amos, *supra* note 15.

134. The collision occurred on February 10, 2009, when a Russian Communications satellite, *Cosmos 2251*, collided with a U.S. communications satellite, *Iridium 33*. Nat'l Aeronautics and Space Admin., *Satellite Collision Leaves Significant Debris Cloud*, 13 ORBITAL DEBRIS Q. NEWS 1 (Apr. 2009), *available at* <http://www.orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv13i2.pdf>.

135. Brian Weeden, *Alternatives to a space weapons treaty*, BULL. ATOMIC SCI. (Apr. 17, 2009), *available at* <http://www.thebulletin.org/web-edition/ops/alternatives-to-space-weapons-treaty>

136. Unclassified Summary National Security Space Strategy, *supra* note 131.

137. *Id.*

consortia” currently operate satellites.¹³⁸ These space systems and their support infrastructures “face a range of man-made threats that may deny, degrade, deceive, disrupt, or destroy assets.”¹³⁹ Furthermore, although “the United States still maintains an overall edge in space capabilities, the U.S. competitive advantage has decreased as market-entry barriers have lowered.”¹⁴⁰ As more nations and non-state actors develop space—and counter-space (such as ASAT)—capabilities, threats to the stability and security of the space environment will continue to increase.¹⁴¹

In this environment, it has become vital that the United States and other space powers secure the safety of their space assets with a ban on debris-producing intentional destruction or damage of space systems beyond a specified altitude in Low Earth Orbit.¹⁴² The United States is no longer assured of its long-term domination in space and cannot rely on the threat of retaliation to protect its satellites.¹⁴³ It has become necessary to create diplomatic initiatives or join on to those already proposed, such as the EU Code¹⁴⁴ or the outline proposed by the Chinese and Russians,¹⁴⁵ to “promote international norms of

138. Ambassador Gregory L. Schulte, *Statement Before the Senate Committee on Armed Services Subcommittee on Strategic Forces* (May 11, 2011), <http://armed-services.senate.gov/statemnt/2011/05%20May/Schulte%2005-11-11.pdf>.

139. UNCLASSIFIED SUMMARY NATIONAL SECURITY SPACE STRATEGY, *supra* note 131. Within months of the destruction of *FY-1C*, India announced that it was working on its own ASAT technology. Cynthia B. Zhang, *Do As I Say, Not As I Do - Is Star Wars Inevitable? Exploring the Future of International Space Regime in the Context of the 2006 U.S. National Space Policy*, 34 RUTGERS COMPUTER & TECH. L.J. 422, 431 (2008), quoting Vivek Raghuvanshi, *China's ASAT Galvanizes Indian Efforts*, DEFENSE NEWS, Apr. 9, 2007, at 20.

140. UNCLASSIFIED SUMMARY NATIONAL SECURITY SPACE STRATEGY, *supra* note 131.

141. *Id.*

142. Liemer & Chyba, *supra* note 75, at 154; see Wolter, *supra* note 33 at 193.

143. Lynn, *supra* note 20, at 8.

144. Council Conclusions concerning the revised draft Code of Conduct for Outer Space Activities [hereinafter Council Conclusions] (EC) No. 14455/10 of 27 Sept. 2010, available at <http://www.consilium.europa.eu/uedocs/cmsUpload/st14455.en10.pdf>.

145. Carin Zissis, *China's Anti-Satellite Test*, COUNCIL ON FOREIGN REL. (Feb. 22, 2007), <http://www.cfr.org/china/chinas-anti-satellite-test/p12684>;

responsible behavior.”¹⁴⁶ Nations acting contrary to these established norms would be singled out¹⁴⁷ and could “expect to be isolated as rogue actors.”¹⁴⁸

Furthermore, any nation conducting a kinetic ASAT test will be liable under the OST and the Liability Convention of 1972, wherein “[n]o exoneration whatever shall be granted in cases where the damage has resulted from activities conducted by a launching State which are not in conformity with international law”¹⁴⁹ A kinetic ASAT testing-ban gives that language teeth.¹⁵⁰ Following the adoption of such a treaty, it will become possible to hold rule-breakers liable for damage resulting from a kinetic ASAT test under a *negligence per se* standard.

Now is the time for the United States to take leadership in promoting a responsible, peaceful, and safe use of space, in part because of the ripeness of the U.S. political climate. The United States government has announced that it “will consider proposals and concepts for arms control measures if they are equitable, effectively verifiable, and enhance the national security of the United States.”¹⁵¹

A treaty creating a testing-ban on the usage of kinetic ASAT technology would meet all the requirements set forth by the Obama Administration in that it would be “equitable, effectively verifiable, and enhance the national security of the United

Michael Krepon, *supra* note 19, at 167 (“China, Russia and many other countries support a treaty banning space weapons.”).

146. Lynn, *supra* note 20, at 8.

147. Schulte, *supra* note 138.

148. Lynn, *supra* note 20, at 8.

149. Liability Convention, *supra* note 58.

A successful ASAT test against an orbiting satellite with a kinetic kill vehicle will result in the destruction of the targeted satellite and the creation of dangerous fast-moving space debris. The resulting space debris is harmful interference that has the potential to damage or destroy other objects in outer space, in particular objects operating in similar orbits or intersecting orbits. . . .

To argue that one had *no reason to believe* that *potentially* harmful interference would occur is beyond the standards of good faith and due regard that are foundation of Article IX [of the OST].

Mineiro, *supra* note 44, at 342–43(2008) (emphasis in original).

150. See Krepon & Black, *supra* note 21, at 242 (“[W]ithout rules, there are no rule-breakers. A Code of Conduct would clarify rules and rule-breakers, making actions against the latter more likely to garner support.”).

151. Schulte, *supra* note 132.

States.”¹⁵² Any such treaty should require that member states refrain from the testing of any technology that intentionally brings about, directly or indirectly, physical damage, or destruction, of outer space objects below an altitude to be determined by the Secretary General of the United Nations, unless such action is conducted to reduce the creation of outer space debris and/or is justified by the inherent right of individual or collective self-defense in accordance with the United Nations Charter or imperative safety considerations.¹⁵³

A treaty creating a testing-ban on the usage of kinetic ASAT technology would be equitable; in other words, it would apply equally to all its member states. While it is possible to argue that some level of inequality exists because only the United States, Russia, and China currently possess kinetic-ASAT technology, disabling the usage of the technology does not weaken any country because of the availability of alternate technologies.

Furthermore, a test-ban treaty would be verifiable, meaning that member states would be able to verify compliance by other member states. This would be especially true for the United States with its “unmatched ability to track launches, satellites, and debris.”¹⁵⁴ A complete ban on the usage of ASAT technology has been called “effectively unverifiable and therefore not worth pursuing.”¹⁵⁵ This criticism correctly identifies that na-

152. *Id.*

153. This language is based on Art. II, Sec. 4.2 of the proposed European Code of Conduct, which states:

The Subscribing States will, in conducting outer space activities:

[R]efrain from any intentional action which will or might bring about, directly or indirectly, the damage or destruction of outer space objects unless such action is conducted to reduce the creation of outer space debris and/or justified by imperative safety considerations

Council Conclusions, *supra* note 144.

154. Liemer & Chyba, *supra* note 75, at 155.

155. Frank M. Walsh, *Forging A Diplomatic Shield for American Satellites: The Case for Reevaluating the 2006 National Space Policy in Light of a Chinese Anti-Satellite System*, 72 J. AIR L. & COM. 759, 788 (2007) (internal citations omitted). “One reason cited by the Americans for not negotiating a[n ASAT] treaty is that it would give an edge to countries (for which, read China) that are trying to hide their efforts to build weapons for use in space.” ECONOMIST, *supra* note 87.

tions and intra-national institutions cannot reasonably monitor the research and development happening within the laboratories of space-capable actors.¹⁵⁶ However, “it would be ‘relatively easy’ to detect the testing . . . or actual use of [kinetic] ASAT technologies.”¹⁵⁷ The United States’ immediate detection of China’s destruction of *FY-1C* “showcased how effectively American intelligence could detect ASAT tests; indeed, the United States also detected the two previous [Chinese ASAT] tests . . .”¹⁵⁸

A kinetic ASAT test-ban treaty also enhances the security of the United States. While the administration of President George W. Bush claimed that such a treaty would interfere with the inherent right of self-defense—“including the right to defend space assets”¹⁵⁹—such an assertion is incorrect.¹⁶⁰ The United States is the nation with “the most to lose,” from an accumulation of space debris.¹⁶¹ The U.S. military relies heavily on satellite technology for “intelligence, communications, meteorology and precision targeting.”¹⁶² In the 2003 Iraq War, the United States “employed more than 50 military-specific satellites plus numerous commercial satellites.”¹⁶³ Without the assistance of space-based capabilities, American military forces

156. See Walsh, *supra* note 155, at 789.

157. *Id.* at 791 (quoting ALLAN S. KRASS, VERIFICATION: HOW MUCH IS ENOUGH? 103 (1985)).

158. *Id.*

159. Krepon & Black, *supra* note 21, at 242. Senator Jeff Sessions (R-Ala.), of the Senate Armed Services strategic forces subcommittee, has also expressed this concern. Turner Brinton, *Sessions, Schulte Spar Over Proposed Space Accord*, SPACENEWS.COM (May 13, 2011), <http://www.spacenews.com/policy/110513-sessions-schulte-spar-accord.html>.

160. See Krepon & Black, *supra* note 21, at 242 (“A Code of Conduct does not nullify the right of self-defense. . . . With such a Code, the USA would still possess more capabilities than ever before to deter and, if necessary, punish states that take actions against US satellites.”).

161. Steven Lee Myers, *Look Out Below. The Arms Race in Space May Be On*, N.Y. TIMES, Mar. 9, 2008, at WK3 (“[T]he United States depends more than any other country on space for its national security.”); Terrence Smith, *Challenges to Future U.S. Space Control*, <http://www.armyspace.army.mil/spacejournal/Article.asp?AID=24> (last visited Dec. 22, 2011) (“The U.S. military is more dependent on Space-based assets than any other military on earth.”).

162. Phillip C. Saunders, *China’s Future in Space: Implications for U.S. Security*, SPACE.COM (May 24, 2005, 8:52 AM), available at <http://www.space.com/1116-chinas-future-space-implications-security.html>.

163. *Id.*

would be severely hindered.¹⁶⁴ The American military's reliance on satellites is its "Achilles' heel."¹⁶⁵ It is "only a slight exaggeration" to say that an M1-A1 tank would be unable to maneuver in a combat zone without the aid of satellites.¹⁶⁶

The United States also relies heavily on satellites for its economic security.¹⁶⁷ Without the ability to use satellites, "[t]he global economic system would probably collapse, along with air travel and communications."¹⁶⁸ Cell phones and A.T.M.s, for example, would cease to function properly.¹⁶⁹

Additionally, adoption of a kinetic ASAT testing-ban would strengthen the United States' ability to address other important international concerns. For instance, the Obama Administration has made repeated attempts to create a Fissile Material Cut-off Treaty ("FMCT"), which would prohibit the production of plutonium and uranium for use in nuclear bombs.¹⁷⁰ In this matter, China has "consistently linked discussions on the 'prevention of an arms race in outerspace' with negotiations on an FMCT, suggesting that a lack of serious U.S. engagement on limiting space weapons could impede FMCT progress."¹⁷¹ Furthermore, entering into a kinetic ASAT test-ban treaty would serve as a stepping stone towards the creation of a "combined space doctrine with principles, goals, and objectives that, in particular, endorse and enable the collabora-

164. "The loss of Space-based RSTA capabilities would have significant impact on U.S. operations and would be difficult to rapidly augment or substitute using strictly terrestrial assets." Smith, *supra* note 161. The United States "no longer maintains comprehensive backup land lines" for communication. Walsh, *supra* note 155, at 771.

165. Walsh, *supra* note 155, at 772.

166. Myers, *supra* note 161.

167. Temple-West, *supra* note 128.

168. Myers, *supra* note 161.

169. *Id.*

170. See, e.g., David E. Sanger & Eric Schmitt, *Pakistani Nuclear Arms Pose Challenge to U.S. Policy*, N.Y. TIMES, Feb. 1, 2011, at A1; Viola Gienger & Indira A.R. Lakshmanan, *Secretary Clinton Urges Treaty to Halt Production of Nuclear Bomb Material*, BLOOMBERG (Feb. 28, 2011, 6:41 PM), <http://www.bloomberg.com/news/2011-02-28/clinton-urges-treaty-to-halt-production-of-nuclear-bomb-material.html>.

171. Liemer & Chyba, *supra* note 75, at 155 (quoting Hu Xiaodi, Ambassador, China, Statement at the Nine Hundredth Plenary Meeting of the Conference on Disarmament, 20 (Mar. 28, 2002), [http://disarmament.un.org/Library.nsf/a61ff5819c4381ee85256bc70068fa14/b16f9f8c1cf762d285256bdd0053524d/\\$FILE/pv900.pdf](http://disarmament.un.org/Library.nsf/a61ff5819c4381ee85256bc70068fa14/b16f9f8c1cf762d285256bdd0053524d/$FILE/pv900.pdf)).

tive sharing of space capabilities in crisis and conflict.”¹⁷² This cooperation will serve to “augment U.S. national security space capabilities.”¹⁷³

The focus on a kinetic ASAT test-ban treaty is intentionally limited in scope. It does not address the testing of ASAT technologies that do not create debris.¹⁷⁴ By staying confined to the effects of kinetic ASAT testing, the testing-ban would be “far easier to negotiate than previous space arms control proposals.”¹⁷⁵ It also avoids the problem of having to define a space weapon,¹⁷⁶ which has been the downfall of previous negotiations.¹⁷⁷ The different methods of defining what constitutes a space weapon has been a leading cause of the international arms control debate over space weapons being “frozen” for decades.¹⁷⁸ Furthermore, a kinetic ASAT test-ban-treaty would function as both an arms control measure and an environmental protection measure, thereby ensuring the continued use of the satellites on which we have come to rely.¹⁷⁹

172. Unclassified Summary National Security Space Strategy, *supra* note 131, at 16. “The benefits of an ASAT treaty would extend beyond protecting American satellites” Walsh, *supra* note 155, at 778; *see generally* Press Release, *Conference on Diasarmament Discusses Prevention of an Arms Race in Outer Space*, UNITED NATIONS OFFICE AT GENEVA (July 31, 2012), http://www.unog.ch/80256EDD006B9C2E/%28httpNewsByYear_en%29/23B0ED99B9B43BC1257A4C003F86B9?OpenDocument.

173. Unclassified Summary National Security Space Strategy, *supra* note 131, at 16.

174. Liemer & Chyba, *supra* note 75, at 155.

175. *Id.* at 154.

176. *See* Krepon & Black, *supra* note 21, at 242.

177. For instance, *see supra* note 80. *See supra* notes 78–79 and accompanying text.

178. Weeden, *supra* note 135.

179. *See* Liemer & Chyba, *supra* note 75, at 154.

Many of us have become somewhat dependent on cell phones. We have plenty of company. The doctor who needs to make an emergency call or to use their pager, as well as the patient in dire need of assistance, rely on satellites. Ambulances that cannot afford to take a wrong turn when every second counts also rely on satellites, if they use Global Positioning System devices. Tens of thousands of police cars in the United States now use satellites to help them get to where they need to go. We need satellites to warn us of dangerous storms that are approaching landfall. We need satellites to help with disaster relief to know the best place to for helicopters to land amidst the chaos of a disaster scene. We need satellites to help those in harm’s way, whether they are wearing a military uniform or not. We

Any proposed treaty should differ from currently proposed treaties, such as the EU Code or the Code proposed by the Henry L. Stimson Center, in several ways. First, it should not create a total ban on the usage of kinetic ASAT technology, as the EU Code does.¹⁸⁰ Any proposed language should allow the use, and even testing, of kinetic ASAT technology below a certain altitude. This would allow for nations that currently lack ASAT technology to develop it, which may facilitate its acceptance into the international community because countries that are developing their space capabilities might regard a universal ban as a means to “lock in an advantage” for China, Russia, and the United States.¹⁸¹ Such countries “might view a universal test ban as unacceptably discriminatory, and therefore choose not to join or to undermine such an agreement.”¹⁸²

The allowance for sub-altitudinal testing also allows for defensive measures to be taken by capable nations. Possible requisite scenarios vary from the fanciful¹⁸³ to those that have already occurred, such as the shooting of *US-193* or the falling satellite that captured attention in September 2011.¹⁸⁴ A kinetic ASAT ceiling would allow for the United States (and other nations) to remain free to intercept such de-orbiting satellites for the protection of people on the planet’s surface and of proprietary technology. States must simply ensure that these measures are taken using reasonable efforts to minimize the creation of space debris.¹⁸⁵

need these satellites more than we appreciate—every single day. Satellites are life savers. They are also essential for national and economic security. The United States is utterly dependant on satellites, and other countries are becoming more dependent on them. Satellites serve global needs.

Krepon, *supra* note 19, at 165.

180. This criticism comes from Paula DeSutter, former Assistant Secretary of State for Verification, Compliance, and Implementation. Jeff Foust, *Debating A Code Of Conduct For Space*, SPACE REVIEW (Mar. 7, 2011), <http://www.thespacereview.com/article/1794/1>.

181. Liemer & Chyba, *supra* note 75, at 157.

182. *Id.*

183. For a list of such ideas in popular culture, see *Asteroids in Fiction*, WIKIPEDIA, http://en.wikipedia.org/wiki/Asteroids_in_fiction (last updated May. 11, 2012).

184. See Kenneth Chang, *Satellite’s Fall Becomes Phenomenon*, N.Y. TIMES, Sept. 23, 2011, at A22.

185. This has been shown to be possible. Mineiro, *supra* note 44, at 353.

Having the Secretary General of the United Nations determine the altitudinal cap addresses another flaw in the EU Code. This flaw was identified by Scott Pace, Director of the Space Policy Institute at George Washington University, who expressed concerns about the vagueness of the EU Code's reference to "international law and security, safety and integrity standards' for respecting the safety of objects in space, without being more specific."¹⁸⁶ Allowing the Secretary General of the United Nations to determine the altitudinal cap solves the vagueness issue by having a single, identifiable, non-partisan entity decide what the appropriate altitude should be. It also incorporates lesser space powers because the cap would be determined by discussions between the space powers or through negotiations at the Conference on Disarmament.¹⁸⁷ Furthermore, having the altitude set by the United Nations circumvents another problem in space-relevant international relations: there is currently "no international consensus on where a nation's airspace ends and space begins."¹⁸⁸

Any proposed treaty language should also allow for physical damage to be caused to outer space objects for the purpose of eliminating space debris and for the protection of important space assets in low-earth orbit. Such "housekeeping" measures may become necessary to prevent the Kessler syndrome, which "will make vast swathes of low-Earth orbit completely unusable."¹⁸⁹ This allowance echoes the EU Code, but differs from the Code of Conduct being proposed by the Henry L. Stimson Cen-

[C]onducting a kinetic ASAT intercept on an orbiting satellite does not in and of itself constitute unavoidable harmful contamination of outer space. It is possible that the underlying target or technology of an ASAT test will generate unavoidable space debris. However, kinetic ASAT tests can be conducted against targets in orbits with altitudes and inclinations that would minimize harmful contamination.

Id.

186. "I always worry about whose standards, and what are those requirements, and what do they mean,' he said." Foust, *supra* note 180.

187. Liemer & Chyba, *supra* note 75, at 158.

188. Imburgia, *supra* note 16, at 611, *citing* U.N. Secretariat, Comm. on the Peaceful Uses of Outer Space, Historical Summary on the Consideration of the Question on the Definition and Delimitation of Outer Space, PP 3-25, U.N. Doc. A/AC.105/769 (Jan. 18, 2002) (describing decades-long attempts to reach a definition, with no agreement). Although the COPUOS "has considered this issue since 1959, it remains unresolved." *Id.*

189. Palmer, *supra* note 107.

ter, which focuses on “no harmful interference” with any space object.¹⁹⁰ Permitting the possibility of debris mitigation allows for proactive solutions to the space debris problem, such as those proposed by the Defense Advanced Research Projects Agency (“DARPA”) or Dr. Marco Castronuovo of the Italian Space Agency.¹⁹¹ The international community should seek to facilitate the solution to the problem of space debris, not hope that inaction will lead to the problem resolving itself.

Finally, as previously discussed, any treaty should focus solely on the physical effects caused by kinetic ASAT testing, which would facilitate its acceptance. By focusing on the physical effects, such language would also help to ensure a verifiable ban but would not ban non-kinetic ASAT research. It seems impossible to determine if another nation is conducting non-physical ASAT technology testing on its own satellites; however, nations would be able to observe a kinetic ASAT test using already existing technology.¹⁹²

CONCLUSION

The time has come for the United States to take leadership in the creating of a kinetic ASAT test-ban-treaty in order to protect mankind’s use of outer space, which has become vital to our way of life. Unless action is taken soon to address the creation of space debris, the danger will continue to grow and will curtail mankind’s freedom to act in space.¹⁹³ As demonstrated

190. Michael Krepon, *supra* note 19, at 166.

191. Dr. Castronuovo proposes the use of small satellites “with two robotic arms: one to intercept a rocket body or failed satellite and hang on, and another to affix an ion-engine thruster that will drive the debris out of orbit.” However, Dr. Castronuovo’s proposed action is unlikely to be politically viable for the same reason that the Carter Administration’s attempts at ASAT negotiations failed; “if you have the power to go to an object in space and pull it down, nothing prevents you from going to an operative satellite and pulling it down” Palmer, *supra* note 107. DARPA’s proposed plan—Operation Phoenix—would involve a similar robotic-arm/satellite-catching concept, but instead would recycle parts from now defunct satellites to be used for the creation and maintenance of newer satellites. *DARPA Wants to Recycle Space Junk Into New Satellites*, SPACE.COM (Oct. 20, 2011), <http://www.space.com/13339-darpa-space-junk-recycling-phoenix-satellites.html>. It is likely that Operation Phoenix is similarly politically not viable.

192. See Krepon & Black, *supra* note 21, at 242. See Liemer & Chyba, *supra* note 75, at 155; Walsh, *supra* note 155, at 791.

193. See Krepon & Black, *supra* note 21, at 243.

in Part III, there exists other, preferable technologies to replace kinetic ASATs as a means of national self-defense in a time of war. With America's, and in fact the whole world's, increasing reliance on space technologies¹⁹⁴ and the burgeoning hopes of exploring beyond our planet,¹⁹⁵ it is necessary to ensure continued access to orbit. An increase in the amount of debris in orbit would significantly impair such usage and exploration. Banning the testing of kinetic ASAT technology is an achievable goal that will do much to prevent this increase. By taking action soon, the United States can prevent the type of failure prophesized by President Lyndon Johnson.¹⁹⁶

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194. See *supra* notes 156–63 and accompanying text.

195. “To push farther out into the solar system—to the moon and beyond, to asteroids, eventually to Mars” Kenneth Chang, *NASA Unveils Giant Rocket That Might Someday Go to Asteroids and Mars*, N.Y. TIMES, Sept. 15, 2001, at A22.

196. HEINLEIN, *supra* note 3.

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