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Space Junk: Why the United Nations Must Step in to Save Access to Space

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SPACE JUNK: WHY THE UNITED NATIONS MUST STEP IN TO SAVE ACCESS TO SPACE

Gabrielle Hollingsworth*

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INTRODUCTION

Humans have only had access to space for approximately fifty years, but our continued access to this highly valuable resource is already in jeopardy. The objects left behind in Earth's orbit have not disappeared, and their numbers continue to grow with continued space use and collisions among existing space debris. These collisions could eventually clutter the Earth's orbit so densely that it would be impossible to continue space missions. This has far-reaching implications. Beyond losing the ability to engage in space exploration, nations will lose access to satellite systems on which they rely for defense, surveillance, and telecommunications. So far, spacefaring nations are reluctant to stifle space exploration or lead the charge to clean up and regulate the issue of space debris. The United Nations has addressed this issue, but has yet to develop a scheme capable of fixing this looming problem.

This Comment explores the problem of space debris, the United Nations bodies capable addressing the issue, and the current and the future development of space law addressing space debris. In Part I, this Comment will discuss and define the types of space debris, their quantities, and the orbits in which they revolve. This section will also address the dangers that the quantities of debris circling our planet pose. The second half of Part I will introduce three different approaches to analyzing space law and will introduce the United Nations Committee on the Peaceful Uses of Outer Space, discussing the contours of the several space related treaties it has implemented. The parts of the treaties that do and do not address space law will be highlighted in this section. This Comment will then proceed to take a deeper

look at what the United Nations has done in regards to addressing, implementing, and mitigating the space debris problem and the shortcomings of its approach. Finally, this Comment will examine how the United Nations can help clean up and mitigate creation of debris by leading the charge in implementing binding policies on any countries that venture into space.

I. BACKGROUND

A. *What Is Space Debris?*

No international space law currently provides a binding definition for space debris.¹ Basically, space debris is comprised of natural or fabricated items that orbit the Earth.² This Comment will focus only on the fabricated items. Debris can consist of anything from nonfunctioning satellites and rocket stages to tools dropped on a space walk.³ Space debris orbits the Earth until it deorbits and burns up in the atmosphere, although for some debris, this will not occur for millions of years.⁴ Space debris became an issue in 1957 after the Soviet Union launched Sputnik-1, the first satellite launched into space.⁵ The problem developed as the United States and the Soviet Union became active figures in outer space, leaving behind debris from their space exploration for years to come.⁶

1. *Categories of Debris*

Scientists have categorized space debris into four types: inactive payloads, operational debris, fragmentation debris, and microparticulate matter.⁷ Inactive payloads are mostly

1. Marla Stayduhar, *Flying the Friendly Skies May Not Be So Friendly in Outer Space: International and Domestic Law Leaves United States' Citizen Space Tourists Without a Remedy for Injury Caused By Government Space Debris*, 7 U. PITT. J. TECH. L. & POL'Y 1, 4 (2006).

2. Robert C. Bird, *Procedural Challenges to Environmental Regulation of Space Debris*, 40 AM. BUS. L.J. 635, 637 (2003).

3. Lieutenant Colonel 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, 593-94 (2011).

4. See Bird, *supra* note 2, at 637.

5. Imburgia, *supra* note 3, at 594.

6. See generally *id.*

7. Michael W. Taylor, *Trashing the Solar System One Planet at a Time: Earth's Orbital Debris Problem*, 20 GEO. INT'L ENVTL. L. REV. 1, 8-9 (2007).

inactive satellites⁸ that “can no longer be controlled by their operators.”⁹ Inactive payloads consist of approximately twenty percent of trackable space debris.¹⁰ Currently, the Air Force Space Command’s Space Surveillance Network (SSN) is tracking about 3000 pieces of inactive payload debris, a few hundred of which are active satellites.¹¹

Operational debris is defined as “any intact object or component part launched or released into space during normal operations,”¹² or as the “residue of past space operations.”¹³ These items include fuel tanks, insulation panels, sewage,¹⁴ rocket bodies, bolts, and straps.¹⁵ The SSN is currently tracking over 1600 rocket bodies and 1400 miscellaneous items under this category.¹⁶ This accounts for twenty-six percent of trackable space debris.¹⁷

Fragmentation debris consists of “small pieces of matter often created by accidental spacecraft explosions” or “collisions between two space objects.”¹⁸ Fragmentation debris may also be created through the deterioration of space debris.¹⁹ This type of debris comprises the largest percentage of all space debris at forty-nine percent.²⁰ The SSN currently tracks over 7000 pieces of fragmentation debris.²¹

The last category, microparticulate matter, is the smallest in size, yet the most numerous.²² Microparticulate matter consists of the propellant particles and gases,²³ spaceglow from the rocket motors and surfaces of spacecraft,²⁴ paint flecks, and rocket fuel.²⁵ This kind of debris is too small

8. *Id.*

9. HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS 4 (1989).

10. Bird, *supra* note 2, at 639.

11. Taylor, *supra* note 7, at 9.

12. *Id.*

13. Bird, *supra* note 2, at 639.

14. *Id.*

15. Taylor, *supra* note 7, at 9.

16. *Id.*

17. Bird, *supra* note 2, at 639.

18. *Id.*

19. Taylor, *supra* note 7, at 9.

20. Bird, *supra* note 2, at 640.

21. Taylor, *supra* note 7, at 10.

22. *See* Bird, *supra* note 2, at 640.

23. Taylor, *supra* note 7, at 11.

24. Stayduhar, *supra* note 1, at 4.

25. Bird, *supra* note 2, at 640.

to be tracked, although it is estimated that there are between ten billion and one quadrillion pieces of microparticulate debris orbiting Earth.²⁶

2. *Amount of Space Debris in Orbit*

In total, there are about 9000 pieces of debris larger than one meter in size in geostationary orbit and larger than ten centimeters in low-Earth orbit.²⁷ NASA acknowledges that approximately 11,000 pieces of space debris larger than ten centimeters in diameter and hundreds of thousands of pieces less than ten centimeters in size currently occupy Earth's orbit.²⁸ In 2010, the SSN was tracking over 21,000 fabricated objects in Earth's orbit, greater than ten centimeters in size.²⁹ Of the fabricated objects, less than 1000 were functioning satellites.³⁰ If nothing more is done to mitigate space debris or to clean it up, this number is projected to reach 50,000 pieces during the next fifty years.³¹ Debris between one and ten centimeters was estimated at 110,000 pieces in 2003,³² totaling 300,000 pieces of debris larger than one centimeter in size. Getting even smaller, debris between one millimeter and one centimeter in size was estimated at thirty-five million pieces in 2003.³³ The United States is responsible for approximately half of all debris in orbit.³⁴

These numbers do not tell the whole story, since the amount of debris in orbit continues to grow with new satellite launches and other space activity.³⁵ Collisions between existing debris are also exacerbating the problem by creating many small pieces of debris from a few larger pieces.³⁶ Several recent examples demonstrate this point.³⁷ In 2007, two events created significantly more debris in space: a

26. *Id.*

27. Lawrence D. Roberts, *A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union*, 15 BERKELEY TECH. L.J. 1095, 1124 (2000).

28. Stayduhar, *supra* note 1, at 5.

29. Imburgia, *supra* note 3, at 594.

30. *Id.*

31. *Id.* at 599.

32. Bird, *supra* note 2, at 638.

33. *Id.*

34. Stayduhar, *supra* note 1, at 2.

35. See Roberts, *supra* note 27, at 1124–25.

36. *Id.*

37. See, e.g., Imburgia, *supra* note 3, at 592.

Russian rocket exploded and China destroyed its own weather satellite as part of an antisatellite mission.³⁸ The destruction of the weather satellite alone created millions of pieces of new debris.³⁹ Two years later, in 2009, a Russian satellite collided with a privately owned satellite, creating thousands of pieces of new debris.⁴⁰ Because collisions between existing objects are creating more debris, and space activity is not likely to subside, the scientific community has expressed a fear that space debris will soon reach a point where access to outer space is impossible.⁴¹ Demonstrating this point, between 2004 and 2010, the growth rate of tracked space debris increased every year except in 2008.⁴² Increased space activity and high demand for space activities by both the private and public sectors is making the debris problem worse.⁴³

3. *The Different Orbits*

The point where airspace ends and outer space begins has yet to be firmly defined.⁴⁴ The United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) has not yet defined where the limit is, although it has considered the issue for over fifty years.⁴⁵ The most widely accepted demarcation is that airspace ends at about 100 kilometers.⁴⁶ NASA uses this altitude in order to define astronaut ratings.⁴⁷

After airspace ends and outer space begins, there are two main orbits relevant to the discussion of space debris: low-Earth orbit (LEO) and geostationary orbit (GEO).⁴⁸ LEO is

38. *Id.*

39. *Id.*

40. *Id.*

41. *See id.* In the past, explosions had been the most common source of space debris creation. *Id.* at 595. However, scientists now predict that more debris will come from collisions instead. *Id.*

42. *Id.* at 599.

43. *Id.*

44. *See id.* at 611–13.

45. *Id.* at 612. “[T]he determination of precise limits for airspace and outer space [does] not present a legal problem calling for priority consideration at this moment” *Id.* (quoting Rep. of the Ad Hoc Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/4141 (1959)).

46. *Id.* This is used by the World Air Sports Federation and adopted by NASA. *Id.*

47. *Id.*

48. *See id.* at 601–03.

the orbit between 100 kilometers above Earth and up to 5500 kilometers in altitude.⁴⁹ An object in LEO orbits Earth once about every ninety minutes.⁵⁰ This proximity to the Earth makes LEO a prime orbit for most of the satellites in orbit.⁵¹ The amount of debris in LEO is difficult to estimate since debris smaller than ten centimeters in size cannot be consistently tracked, and most countries are only able to continuously track debris larger than thirty centimeters in size.⁵² The length of time an object stays in LEO before deorbiting depends on its size and its altitude.⁵³ An object at 200 to 400 kilometers above Earth could orbit for a couple of months before it deorbits and burns up in the atmosphere, while an object between 400 and 900 kilometers above Earth could orbit for a several years or even hundreds of years depending on its size.⁵⁴ An object in high LEO orbit, at around 4000 kilometers above the earth could orbit for 20,000 years or more.⁵⁵

GEO orbit extends beyond the LEO orbit.⁵⁶ The most common GEO orbit is geosynchronous orbit, at approximately 35,000 kilometers above the Earth's equator.⁵⁷ At this altitude, the object's orbit mirrors the Earth's orbit, taking one day to complete.⁵⁸ A satellite in GEO appears to be stationary from Earth.⁵⁹ The amount of debris in GEO is difficult to estimate because an object must be approximately one meter in size or larger to be tracked by the SSN.⁶⁰ Unlike debris in LEO, however, debris in GEO will not deorbit independently.⁶¹ A piece of space debris in GEO will be there between one million and ten-million years.⁶²

49. *Id.* at 601.

50. *Id.*

51. *See id.* at 601–02.

52. *Id.* at 602. The SSN is most capable of consistently tracking and cataloging debris greater than ten centimeters in size. *Id.*

53. *Id.*

54. *Id.* For example, a satellite launched in 1958 continues to orbit the Earth in LEO and could continue to do so for another 200 years. *Id.*

55. *See id.* at 603 (estimating that the orbital lifespan of China's debris could be as long as 20,000 years).

56. *See id.*

57. *Id.*

58. Roberts, *supra* note 27, at 1099.

59. *Id.*

60. Imburgia, *supra* note 3, at 603.

61. *Id.*

62. *Id.*

Most satellites within GEO operate within a thirty-kilometer band, making this popular area even more crowded and prone to debris, creating collisions.⁶³ Additionally, certain locations within the band are highly desirable based on the range of geographic locations a satellite in this position can reach.⁶⁴ A location where a satellite can reach both coasts of the United States, for example, is in high demand within this already crowded narrow band.⁶⁵ In order to organize this chaos, the International Telecommunication Union (ITU) administers the high-demand spaces and frequencies for satellites operating in GEO.⁶⁶ The ITU facilitates the application process for these spots, and requires the registration of the satellites with the ITU in order to ensure its availability.⁶⁷ Although the ITU seeks to ameliorate some of the crowding, the accumulating debris from inactive payloads and collisions between satellites counteracts the remedy, especially when the debris continues to orbit for so long.

4. *The Danger of Space Debris*

Space debris, no matter the size, is dangerous to manned and unmanned spacecrafts because it travels at such high speeds.⁶⁸ In LEO, a piece of debris only one centimeter in diameter has the potential to damage a spacecraft.⁶⁹ Even a paint chip, as small as 0.5 millimeters in size, could puncture a spacesuit and kill an astronaut on a spacewalk.⁷⁰ A much smaller paint chip, which was traveling at three to six kilometers per second, proved strong enough to damage the durable Challenger shuttle.⁷¹ The collision necessitated the replacement of one of the shuttle's windows.⁷² Traveling at

63. Roberts, *supra* note 27, at 1101.

64. *See id.* at 1101–02.

65. *See id.* at 1102.

66. *See id.* at 1105.

67. *See id.* at 1112.

68. *See id.* at 1125.

69. *Id.*

70. BAKER, *supra* note 9, at 10. A paint chip this small does such destructive damage because it would travel at approximately ten kilometers per second, which is equivalent to about 35,000 kilometers per hour. *Id.*

71. *See id.* at 11; Bird, *supra* note 2, at 640. The debris was about 0.2 millimeters in size. BAKER, *supra* note 9, at 11; Bird, *supra* note 2, at 640 & n.39.

72. Bird, *supra* note 2, at 640.

such high speeds, a piece of debris weighing as little as two grams could hit another object with the force of one-kilogram of TNT.⁷³

The risk of damage at the hands of high-speed space debris is especially worrisome since all human space activity currently occurs in LEO, and the risk of collision with other spacecraft and astronauts makes LEO physically dangerous.⁷⁴ In 2009, astronauts on the ISS evacuated and hid in the escape capsule on multiple occasions to protect themselves from debris collisions.⁷⁵

The future of spaceflight is in jeopardy unless immediate action to mitigate and clean up space debris is taken.⁷⁶ A study by NASA scientists in 2006 predicted that even if all satellite launches ceased after 2005, there would still be three times more debris larger than ten centimeters and ten times more collisions in Earth's orbit in the next 200 years.⁷⁷ The situation is certain to be much worse than this, however, as satellite launches have not ceased, and more and more countries are aspiring to implement their own space programs.⁷⁸ A 2008 report to the United Nations predicted that the tipping point for space debris in Earth's orbit could potentially occur within the next ten to fifty years.⁷⁹ Such a bleak outlook requires immediate attention in order to preserve access to space.

5. *The Tipping Point: The Cascade Effect*

The cascade effect is a term used to describe the phenomenon that will occur when space debris reaches an unsustainable threshold and access to space becomes impossible.⁸⁰ The hypothesis is that large pieces of space debris will collide with each other, creating more and more

73. Lucinda R. Roberts, Comment, *Orbital Debris: Another Pollution Problem for the International Legal Community*, 11 FLA. J. INT'L L. 613, 615–16 (1997). If a one-centimeter piece of debris hit the International Space Station (ISS), it could penetrate and destroy the ISS, killing the individuals inside. Bird, *supra* note 2, at 641.

74. Roberts, *supra* note 73, at 616; *see also* Bird, *supra* note 2, at 640–41.

75. Imburgia, *supra* note 3, at 595.

76. *See id.* at 606.

77. *Id.* at 605–06.

78. *Id.* at 606.

79. *Id.* at 607.

80. *See* Stayduhar, *supra* note 1, at 5.

pieces of smaller debris.⁸¹ As more debris is created, more collisions will occur between the new debris, perpetuating the problem.⁸² At a certain point, “collisions between objects will create so much new debris that it will increase independently of further space operations.”⁸³ Without intervention or mitigation, an impassable debris shield around the Earth could prevent future outer space activities.⁸⁴ This scenario would make outer space unusable for hundreds of years, until much of the debris deorbited into the Earth’s atmosphere.⁸⁵ Mitigation efforts, according to some, are not enough at this point, and cleanup efforts are necessary to prevent disaster.⁸⁶

B. Three Analogies for an Approach to Space Law

The dynamics of space exploration puts the goals of a few powerful spacefaring nations against the goals of non-spacefaring nations.⁸⁷ These few nations in space are “concerned with optimizing the use and exploration of outer space, while non-spacefaring states have been concerned with influencing rulemaking to . . . protect their own future interests.”⁸⁸ The United States and the Soviet Union shaped the first set of outer space agreements to closely parallel their respective wants and wishes.⁸⁹ As space law develops, three analogies may be drawn to analyze the direction the development is headed and to determine the appropriate next steps. The analogies are to airspace, the high seas, and Antarctica.⁹⁰

81. Bird, *supra* note 2, at 643; Stayduhar, *supra* note 1, at 5.

82. Bird, *supra* note 2, at 643.

83. *Id.* The threshold, or the critical mass is the point at which one piece of debris crashes into another causing a domino effect of collisions. Imburgia, *supra* note 3, at 597.

84. Bird, *supra* note 2, at 643.

85. Imburgia, *supra* note 3, at 598. As previously noted, some believe that this scenario could occur as early as the next decade. *Id.* Nicholas L. Johnson, NASA’s chief scientist for orbital debris, believes the cascade effect is certain unless immediate efforts are taken to clean up the debris. *Id.* at 598–99.

86. *See id.* at 598.

87. *See* Nina Tannenwald, *Law Versus Power on the High Frontier: The Case for a Rule-Based Regime for Outer Space*, 29 YALE J. INT’L L. 363, 371 (2004).

88. *Id.*

89. *Id.* at 373.

90. *Id.* at 373–75.

1. *Airspace*

Under airspace law, a state has control over all airspace activity in its territory.⁹¹ The laws that apply on land should also apply to the airspace above the land.⁹² As applied to space law, a nation would be able to subject the satellites in outer space to the laws of the terrestrial nation.⁹³ The Soviet Union originally pushed for the airspace analogy early in the development of space law because it wanted to have control of any satellite military surveillance over the Soviet Union.⁹⁴ Once it developed its own satellite military surveillance capabilities, however, it backed away from the airspace approach.⁹⁵

2. *Antarctica*

The Antarctic Treaty of 1959 established that Antarctica was reserved only for peaceful uses.⁹⁶ This analogy, however, is best applied to the moon rather than to space law generally or, more specifically, to space debris.⁹⁷ Although the demilitarization of space analogy is easily drawn, space debris and satellite orbits have very little in common with the physical properties that Antarctica and the moon share.⁹⁸

3. *High Seas*

Under a high seas analogy, nations would treat space as a commons open to use by all.⁹⁹ Before the Law of the Sea (LOS) Convention in 1982, the law of the high seas was dictated by the dominant powers, such as Great Britain.¹⁰⁰ The LOS Convention changed the point of view of the law of high seas in order to “establish[] the notion of the common heritage of mankind as a guiding principle for regulating the

91. *Id.* at 373.

92. *Id.*

93. *See id.* at 373–74.

94. *Id.* at 374.

95. *Id.*

96. *Id.*

97. *Id.* at 375.

98. *Id.* The Moon and Antarctica share many similar qualities: remoteness, difficult environments, and a “perceived lack of advantage associated with military facilities.” *Id.*

99. *Id.* at 374.

100. *Id.* at 395.

use of global commons.”¹⁰¹ During the 1950s, most nations and international lawyers supported a high seas approach to space law because they wanted to avoid making space appropriable, as it would be under an airspace analogy.¹⁰² Currently, space law closely resembles the law of the high seas before the LOS Convention, when principles were vague and broadly interpreted and nations picked the laws and practices they abided by.¹⁰³ These qualities most closely resemble the current status of international space law, where a few powerful nations such as the United States and Russia take the lead and interpret and vaguely apply the space treaties in their favor.¹⁰⁴

C. UN COPUOS and Its Subsidiary Bodies

The UN COPUOS and its subsidiary bodies “serve as a forum for discussion of relevant [space] issues among Member States.”¹⁰⁵ The annual Inter-Agency Meeting on Outer Space Activities works to coordinate all space related activities that operate within the United Nations.¹⁰⁶ All United Nations entities concerned with space activity attend the Inter-Agency Meeting to review the current and future plans the entities have.¹⁰⁷ The meeting also convenes to consider the Secretary-General’s annual report on the Coordination of Outer Space Activities Within the United Nations System.¹⁰⁸ This is to ensure that the different entities are pursuing coherent goals under the banner of the United Nations and that each entity’s plan is not duplicative of another.¹⁰⁹ As the main United Nations body addressing space issues, it is the most appropriate United Nations body to handle space debris, its mitigation, and its clean up.¹¹⁰

101. *Id.*

102. *Id.* at 374.

103. *Id.* at 395.

104. *See id.*

105. *Frequently Asked Questions*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/FAQ/un.html> (last visited Feb. 20, 2013).

106. *Id.*

107. *Id.*

108. *Id.*

109. *Id.*

110. *See International Space Law*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/SpaceLaw/index.html> (last visited Feb. 20, 2013). “Significant resources combined with a respected

1. *United Nations Office for Outer Space Affairs*

The United Nations Office for Outer Space Affairs (UNOOSA), based in Vienna, is the Secretariat for the Legal Subcommittee of COPUOS.¹¹¹ Mazlan Othman of Malaysia has been the UNOOSA Director since December 2007.¹¹² The office provides “parliamentary services . . . [and] prepares legal studies and background documents on various aspects of space law to assist member States in their deliberations.”¹¹³ The office works to implement the recommendations of UN COPUOS and the United Nations General Assembly.¹¹⁴ UNOOSA also maintains the Register of Objects Launched into Outer Space on behalf of the Secretary-General and handles volunteered information transmitted by Member States and other parties to the Registration Convention.¹¹⁵ The office also distributes information on outer space activity and its applications, with a particular focus on aiding developing countries in gaining “access to space technology and applications through the Programme on Space Applications,” organizing and implementing the Programme.¹¹⁶

The United Nations Programme on Space Applications is a part of UNOOSA that organizes annual seminars, workshops, and conferences on topics in space technology and its applications.¹¹⁷ The Programme focuses on developing countries and the use of the information and space technology for their economic and social development,¹¹⁸ and assists them

status as a permanent U.N. body make COPUOS the likely primary source of space debris regime building.” Bird, *supra* note 2, at 643–44.

111. *International Space Law*, *supra* note 110.

112. *United Nations Office for Outer Space Affairs (UNOOSA)*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/OOSA/index.html> (last visited Feb. 20, 2013).

113. *International Space Law*, *supra* note 110.

114. *See id.*

115. *Frequently Asked Questions*, *supra* note 105. The Office has done this since 1962, per U.N. General Assembly Resolution 1721 B (XVI). *Register of Objects Launched into Outer Space*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/SORegister/index.html> (last visited Feb. 20, 2013).

116. *Frequently Asked Questions*, *supra* note 105. This includes providing information and advice to governments, nongovernmental organizations, and the public on the topic of space law. *International Space Law*, *supra* at note 110.

117. *Frequently Asked Questions*, *supra* note 105.

118. *Id.* One example of an application of space technology is the growth of

“in organizing and developing space applications programmes and projects.”¹¹⁹

UNOOSA is further divided into two sections: the Space Applications Section (SAS) and the Committee Services and Research Section (CSRS).¹²⁰ SAS is responsible for implementing programs to distribute information and train states, particularly developing nations, in the practical applications of space technology.¹²¹ In particular, it is responsible for organizing and carrying out the United Nations Programme on Space applications, discussed above.¹²² Takao Doi of Japan has headed SAS since 2009 as the Expert on Space Applications and Chief of the Space Applications Section.¹²³

The CSRS is responsible for providing UN COPUOS and its two subcommittees with secretariat services.¹²⁴ Additionally, CSRS creates reports on topics concerning international space activities and the law.¹²⁵ Niklas Hedman of Sweden heads CSRS, and has done so since January 2006.¹²⁶

2. *Committee on the Peaceful Uses of Outer Space*

In 1958, following the Russian launch of Sputnik-1, the first artificial satellite, the General Assembly resolved to create an ad hoc Committee on the Peaceful Uses of Outer Space (UN COPUOS).¹²⁷ In 1959, the General Assembly established the permanent committee under Resolution 1472 (XIV)¹²⁸ in order to:

Gallium Arsenide crystals in outer space. Bird, *supra* note 2, at 642. These crystals are used in computer chips, and make the chip eight times faster than a regular chip, but cannot be easily grown on Earth. *Id.*

119. *Frequently Asked Questions*, *supra* note 105.

120. UNOOSA, *supra* note 112.

121. *Id.*

122. *Id.*

123. *Id.*

124. *Id.*

125. *Id.* Topics may be anything from background information, to studies in space research, to applications of space technologies. *Id.*

126. *Id.*

127. *Members*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/COPUOS/members.html> (last visited Feb. 20, 2013).

128. *Id.*

[R]eview the scope of international cooperation in peaceful uses of outer space, to devise programmes in this field to be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space.¹²⁹

UN COPUOS began with only eighteen members in 1958 that met to consider the peaceful uses of outer space, international cooperation, and space related legal problems.¹³⁰ By 1959, the Committee had twenty-four members, which has now grown to include seventy-four members plus nongovernmental organizations and organizations with observer status, making it one of the largest United Nations committees.¹³¹ In 1961, the General Assembly desired to put the United Nations at the center of international space cooperation, and resolved to keep “close contact with governmental and non-governmental organizations concerned with outer space matters,” and to allow for the exchange of information on space activity.¹³² Today, UN COPUOS is the “primary international forum for the development of laws and principles governing outer space.”¹³³

UN COPUOS is further divided into two subcommittees: the Scientific and Technical Subcommittee (STS) and the Legal Subcommittee.¹³⁴ Each subcommittee meets annually “to consider questions put before them by the General Assembly, reports submitted to them and issues raised by the Member States.”¹³⁵ As part of the STS’s annual meeting, it hears scientific and technical presentations on space activities, reviews recent space activities and events, and discusses national space activities.¹³⁶ The Legal

129. *United Nations Committee on the Peaceful Uses of Outer Space*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html> (last visited Feb. 20, 2013).

130. *History and Overview of Activities*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, http://www.oosa.unvienna.org/oosa/en/COPUOS/cop_overview.html (last visited Feb. 20, 2013).

131. *Members*, *supra* note 127.

132. *History and Overview of Activities*, *supra* note 130.

133. *International Space Law*, *supra* note 110.

134. *Frequently Asked Questions*, *supra* note 105.

135. *United Nations Committee on the Peaceful Uses of Outer Space*, *supra* note 129.

136. *See* Comm. on the Peaceful Uses of Outer Space, Rep. of the Scientific and Technical Subcomm., Rep. on its 48th Sess., Feb. 7–18, 2011, para. 11, U.N.

Subcommittee manages the legal aspects of international space law, including the treaties governing outer space,¹³⁷ which will be discussed next.

D. The Applicable United Nations Treaties Governing Outer Space

The United Nations defines international space law as the “body of law applicable to and governing space-related activities.”¹³⁸ This includes five international treaties and five sets of principles established under the United Nations,¹³⁹ as well as national laws, conventions, and the rules and regulations of international organizations that govern space activity.¹⁴⁰ Four of the five treaties and principles will be discussed below, with the exclusion of the Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement), as it is not relevant to this discussion of space debris. The goal of the United Nations treaties and principles is to “ensure a rational, responsible approach to the exploration and use of outer space for the benefit and in the interests of all humankind.”¹⁴¹ They encompass topics such as military activity in space, damages liability, the outer space environment, and dispute settlement on behalf of states and nongovernmental entities alike.¹⁴²

Doc. A/AC.105/987 (Mar. 7, 2011).

137. See Imburgia, *supra* note 3, at 626. Part of the Legal Subcommittee is a working group designed to analyze the applicability of the current space treaties to space debris. *Id.*

138. *Space Law: Frequently Asked Questions*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/FAQ/splawfaq.html> (last visited Feb. 20, 2013).

139. *Id.* The difference between a treaty and principle is that the treaties can be ratified and signed by Member States, and will subsequently be binding on ratification. *Id.* Principles “articulate agreed upon principles relating to the exploration and use of outer space which may guide even those States which have not legally bound themselves to the provisions.” *Id.* Principles have the legal status of General Assembly Resolutions. *Id.*

140. *Id.* These international laws may encompass the commercial uses of space, or agreements that establish intergovernmental organizations “with functions in space” such as the International Space Station or the World Meteorological Organization. Tannenwald, *supra* note 87, at 370.

141. *Space Law: Frequently Asked Questions*, *supra* note 138.

142. *Id.* A nongovernmental organization will, however, need authorization and supervision from an “appropriate State Party.” *Id.*

1. *The Outer Space Treaty*

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty) was ratified in 1967.¹⁴³ The Outer Space Treaty holds parties to the agreement liable for damages for launching an object into outer space.¹⁴⁴ It additionally provides for the exploration and use of space for peaceful purposes, which is described as the common interest of mankind.¹⁴⁵ This treaty was constructed during the beginnings of space activity when space missions were very expensive and rare, so it does not provide detailed provisions.¹⁴⁶ Although this treaty makes no mention of the outer space environment or space debris, it serves as the basis for all later treaties governing outer space.¹⁴⁷

Some of the Outer Space Treaty's provisions, however, may prove applicable to space debris and be utilized in its mitigation and regulation. Under Article V of the treaty,¹⁴⁸ parties are required to inform other parties or the United Nations of anything that "could constitute a danger to life or health of astronauts."¹⁴⁹ This provision could possibly be used to require states to report space debris, particularly in LEO, in the case that the debris is on course to collide with a manned spacecraft.¹⁵⁰ Article VI¹⁵¹ holds parties responsible for any objects they launch into outer space.¹⁵² This provision

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

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

145. Roberts, *supra* note 73, at 617–18.

146. Roberts, *supra* note 27, at 1124.

147. See Imburgia, *supra* note 3, at 613–14, 616.

148. Outer Space Treaty, *supra* note 143, art. V.

149. Bird, *supra* note 2, at 654 (quoting Outer Space Treaty, *supra* note 143, art. V).

150. See *id.*

151. Outer Space Treaty, *supra* note 143, art. VI.

152. Bird, *supra* note 2, at 654.

could potentially include objects even after they are inactive or become thousands of pieces of debris.¹⁵³ The problem here, though, is that a space object is never defined in the treaty, so whether or not an object is covered remains unanswered.¹⁵⁴ Lastly, Article IX¹⁵⁵ addresses the space environment, requiring parties to avoid “harmful contamination of outer space.”¹⁵⁶ States are required to inform the public, along with international scientific communities, of space activity that might cause harmful interference with another state’s space activity.¹⁵⁷ This could extend to the space debris problem as well, requiring parties to provide more disclosure regarding destructive space activities.¹⁵⁸ The problem with this provision, however, is that there is no clarification as to what harmful interference actually is, leaving it open to interpretation and debate.¹⁵⁹ Perhaps it applies to space debris, or perhaps the Outer Space Treaty is limited in its application to astronauts and spacecraft only.¹⁶⁰ The holes in the early Outer Space Treaty leave too much open for interpretation to be directly applicable to the current space debris problem.

2. *The Liability Convention*

The Convention on International Liability for Damage Caused by Space Objects (Liability Convention) was ratified in 1972 to hold states liable for their wrongdoings in space.¹⁶¹ The Liability Convention holds a launching state strictly liable for damage caused on Earth, and holds such a state liable based on fault for harm caused in outer space, expanding upon the liability provisions of the 1967 Outer Space Treaty.¹⁶²

Although the Liability Convention is not capable of imposing a duty to clean up or mitigate space debris creation,

153. *See id.*

154. *See Imburgia, supra* note 3, at 615.

155. Outer Space Treaty, *supra* note 143, art. IX.

156. Bird, *supra* note 2, at 654 (quoting Outer Space Treaty, *supra* note 143, art. IX).

157. *Id.*

158. *See id.*

159. Imburgia, *supra* note 3, at 614–15.

160. *Id.*

161. *See* Bird, *supra* note 2, at 654.

162. Stayduhar, *supra* note 1, at 7.

several provisions of the Liability Convention could extend liability to debris creating states.¹⁶³ Under Article II,¹⁶⁴ states are strictly liable for all damage from their space related objects on Earth or in airspace, and Article III¹⁶⁵ “imposes fault-based liability for damage occurring in orbit.”¹⁶⁶ These provisions could encompass legal liability for collisions between space debris; however, it is unclear if the definition of space object under the Liability Convention covers debris.¹⁶⁷ The definition of space object under the Liability Convention includes “component parts of a space object as well as its launch vehicle and parts thereof” but does not go any further to define what a component part is exactly.¹⁶⁸ Space debris might loosely fit under this category, but this is, again, unclear and uncertain.¹⁶⁹ An additional problem with the fit of the Liability Convention for purposes of space debris liability is that space debris would be subject to fault-based liability.¹⁷⁰ Fault-based liability is incredibly hard to prove in space, and especially so with space debris that is not always identifiable or trackable.¹⁷¹ The Liability Convention is logistically not the solution for mitigating the space debris problem through a scheme of liability.¹⁷²

3. *The Registration Convention*

The Convention on Registration of Objects Launched into Outer Space (Registration Convention) requires states to keep a registry of all objects launched into space, and to provide the United Nations Secretary-General with information about the launch.¹⁷³ Each launching state must provide the name of the state, a designation or registration number for the object,

163. *See id.* at 7–8.

164. Convention on International Liability for Damage Caused by Space Objects art. II, Mar. 29, 1972, 961 U.N.T.S. 187 [hereinafter Liability Convention].

165. *Id.* at art. III.

166. Bird, *supra* note 2, at 654.

167. Imburgia, *supra* note 3, at 616. A definition for space object, which was missing in the Outer Space Treaty, was included in the Liability Convention. *Id.*

168. *Id.* (quoting Liability Convention, *supra* note 164, art. I(d)).

169. *See id.*

170. *Id.* at 617.

171. *Id.* at 617–18.

172. *See id.*

173. *Space Law: Frequently Asked Questions*, *supra* note 138.

and details regarding the launch and orbital parameters.¹⁷⁴ The Online Index of Objects Launched into Outer Space makes the records publicly searchable through the United Nations Secretariat.¹⁷⁵ This registry lists information for launches since 1957 to the present, but does not include any space debris or nonfunctioning orbital objects.¹⁷⁶

The purpose of the Registration Convention is to give states a “solid basis for [liability] claims” to damaged objects.¹⁷⁷ This is difficult to do with space debris, however, because the debris is often unidentifiable.¹⁷⁸ Certain aspects of the Registration Convention would be applicable to the identification and mitigation of space debris.¹⁷⁹ The problem with the current Registration Convention, though, is that many launches go unregistered and unreported to the United Nations.¹⁸⁰ Additionally, the Convention lacks a timeline for registration and reporting, which also does not help get nations to report launches.¹⁸¹ This scenario makes it even more difficult for nations to identify whose object is at fault for damage.¹⁸² Furthermore, the Registration Convention is unclear as to whether debris may be included in the registration provisions, although this is unlikely.¹⁸³ Even if debris and inactive satellites were covered under the Convention, finding liable parties would be nearly impossible with the amount of registration noncompliance.¹⁸⁴ The Registration Convention does not provide adequate regulation for space debris, either.

174. *Registration of Objects Launched into Outer Space*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/SORegister/regist.html> (last visited Feb. 20, 2013).

175. *Space Law: Frequently Asked Questions*, *supra* note 138; see *Online Index of Objects Launched into Outer Space*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/soindex.html> (last updated Feb. 19, 2013).

176. *Online Index of Objects Launched into Outer Space*, *supra* note 175.

177. Roberts, *supra* note 73, at 622.

178. *See id.*

179. *See Imburgia*, *supra* note 3, at 618–19.

180. *Id.*

181. *Id.* at 618.

182. *Id.* at 619.

183. *Id.*

184. *Id.*

4. *The Moon Agreement*

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty) became effective in 1984.¹⁸⁵ The Moon Treaty applies to the Moon and celestial bodies other than the Earth.¹⁸⁶ It requires states to (1) “take measures to prevent the disruption of the existing balance of its environment, whether by . . . the introduction of extra-environmental matter or otherwise,”¹⁸⁷ and (2) to “bear international responsibility for national activities on the moon.”¹⁸⁸ Although the Moon Treaty, like the other space treaties, does not apply directly to space debris, it is useful for articulating the beginnings of an environmental standard for Earth orbit, although it does not provide for any remedies or legal courses of action that would be necessary components for the space debris solution.¹⁸⁹

Although portions of the above treaties and principles are vaguely applicable to space debris, they are not nearly enough to provide a workable framework as a solution to the problem.¹⁹⁰ The above treaties are simply too broad and not sufficiently narrowly tailored to provide the international legal community with a uniform solution.¹⁹¹

II. IDENTIFICATION OF THE LEGAL PROBLEM

While UN COPUOS has several treaties that address outer space, none of them directly address the very important problem of space debris. Space debris has been a known threat to space exploration and access, yet none of the treaties have sought to set binding principles on member nations. Spacefaring nations themselves are unlikely to be the leaders in this realm because they are self-interested in exploring space as they please. As a result, the United

185. *United Nations Treaties and Principles on Space Law*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, <http://www.oosa.unvienna.org/oosa/en/SpaceLaw/treaties.html> (last visited Feb. 20, 2013).

186. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 68, U.N. GAOR, 34th Sess., Supp. No. 46, U.N. Doc. A/68, art. I (1979), (Dec. 18, 1979), *available at* http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares_34_0068.html.

187. *Id.* at art. VII.

188. *Id.* at art. XIV; Bird, *supra* note 2, at 655.

189. *See* Bird, *supra* note 2, at 655–56.

190. *See id.*

191. *See id.*

Nations must step in to address the space debris problem head on, binding its members to a set of mitigation and clean up principles.

III. ANALYSIS

A. *The UN COPUOS Approach: Addressing the Space Debris Problem*

In 1993, the United Nations General Assembly made a resolution asking the UN COPUOS Scientific and Technical Subcommittee to make space debris a formal agenda item.¹⁹² In 1994, the STS followed the recommendation of the General Assembly and included space debris on its session agenda.¹⁹³ The subsequent year, the STS made space debris a priority issue, also at the bequest of the General Assembly.¹⁹⁴ During the 1995 session, the STS attempted to define space debris, but failed to agree to an official definition.¹⁹⁵ The attempted definition defined space debris as “all man-made objects, including their fragments and parts, in Earth orbit or reentering . . . the atmosphere,” functional or not, with or without an identifiable owner.¹⁹⁶ Neither the STS nor the Legal Subcommittee of UN COPUOS has officially defined space debris to date.¹⁹⁷

In 1996, the STS came to a conclusion on how to measure space debris.¹⁹⁸ The STS concluded that a large piece of debris is bigger than ten centimeters.¹⁹⁹ The reasoning behind this decision was that debris of this size is easily tracked.²⁰⁰ Additionally, the subcommittee recognized that debris of this size is extremely harmful given the speed at which it travels in outer space.²⁰¹

192. Imburgia, *supra* note 3, at 620.

193. *Id.* at 621.

194. *Id.* at 620–21.

195. *Id.* at 621.

196. *Id.* (quoting Comm. on the Peaceful Uses of Outer Space, Scientific & Technical Subcomm., Rep. on its 32d Sess., Feb. 6–16, 1995, para. 95, U.N. Doc. A/AC.105/605 (Feb. 24, 1995)).

197. *See id.* at 621, 626.

198. *Id.* at 621.

199. *Id.*

200. *Id.*

201. *Id.* at 621–22.

In 1998, four years after the subcommittee had begun discussing space debris, the STS finally addressed the mitigation and removal of space debris.²⁰² Several countries, including the United States and Russia, presented on the topic.²⁰³ Some delegations expressed the concern that even if space debris removal was not presently possible, nations should still place importance on developing the necessary technologies and capabilities for future benefit.²⁰⁴ Other delegations expressed the view that the problem of space debris was not yet ripe for consideration by the Legal Subcommittee, at least until the STS made further progress.²⁰⁵ At the conclusion of this session, the STS agreed that a draft of space debris mitigation measures should be included in its report to the General Assembly and adopted the following year.²⁰⁶ In 1999, the STS adopted the space debris mitigation measures, and distributed them to the Legal Subcommittee for review and comment.²⁰⁷ The review delayed the process, taking an additional seven years.²⁰⁸

B. UN COPUOS Guidelines for Space Debris Mitigation

In 2007, the aforementioned review process ended, and UN COPUOS submitted the nonbinding guidelines to the General Assembly for consideration and possibly implementation.²⁰⁹ The nonbinding guidelines, as they appear in the 2007 STS report are as follows:

- 1: Limit debris released during normal operations . . .
- 2: Minimize the potential for break-ups during operational phases . . .
- 3: Limit the probability of accidental collision in orbit . . .
- 4: Avoid intentional destruction and other harmful activities . . .
- 5: Minimize potential for post-mission break-ups resulting from stored energy . . .
- 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]
- 7: Limit the long-term interference of spacecraft and launch vehicle

202. *Id.* at 622.

203. *Id.*

204. *Id.*

205. *Id.*

206. *Id.*

207. *Id.*

208. *Id.* at 623.

209. *Id.*

orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission.²¹⁰

It is important to remember though, that these guidelines are nonbinding, and do not require any nation to abide by any particular uniform mitigations standards, or any mitigation standards at all. Along with the guidelines, the STS provided a definition of space debris, but only for the purposes of the guidelines.²¹¹ The definition of space debris, as compared to its earlier definition, excludes mention of ownership, and limits space debris to nonfunctional objects.²¹² This definition, like its debris mitigation counterparts, is nonbinding, and only relevant to the nonbinding guidelines.²¹³

In 2008, the General Assembly adopted the mitigation measures by resolution.²¹⁴ The biggest issue, still, is that the mitigation measures are nonbinding and do not require or compel uniform practices by the world's spacefaring nations.²¹⁵ In effect, the UN COPUOS mitigation measures do nothing to keep the space debris problem from worsening.²¹⁶ At best, the measures provoke international thought on the topic, encouraging spacefaring nations to adopt different approaches in their national space law and policy.²¹⁷ In recognizing that the current United Nations approach to space debris is still lacking, the General Assembly directed the UN COPUOS Legal Subcommittee to reconvene its working group in charge of looking at current United Nations treaties as they apply to space debris, and determining whether a new treaty directly addressing space

210. Comm. on the Peaceful Uses of Outer Space, Scientific & Technical Subcomm., Rep. on its 44th Sess., Feb. 12–23, 2007, Annex IV para. 4, U.N. Doc. A/AC.105/890 (Mar. 6, 2007), available at http://www.oosa.unvienna.org/pdf/reports/ac105/AC105_890E.pdf [hereinafter, STS Report]; Imburgia, *supra* note 3, at 623–24.

211. Imburgia, *supra* note 3, at 624. The definition, like the guidelines, is nonbinding and only applicable to the mitigation guidelines. *Id.*

212. STS Report, *supra* note 210, at para. 1; Imburgia, *supra* note 3, at 624. The definition defines space debris as “all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional.” STS Report, *supra* note 210, at para. 1; *see also* Imburgia, *supra* note 3, at 624.

213. Imburgia, *supra* note 3, at 624.

214. *Id.*

215. *Id.* at 624–26.

216. *See id.*

217. *See id.*

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debris is needed.²¹⁸

IV. PROPOSAL

A. Solving the Current Problem: Cleaning Up the Trash and Mitigation

According to the scientists at NASA and the European Space Agency, mitigation is no longer enough to avoid an inevitable cascade effect.²¹⁹ This is especially an issue for debris in GEO, since debris in GEO will not deorbit on its own.²²⁰ Although no cleanup techniques are functional, there are some ideas about how we might remove debris from orbit. One such idea is Orion, a debris removal program that proposes to use lasers to move objects out of orbit.²²¹ Lasers and sensors would “detect, track, and eliminate debris of various sizes by nudging fragments out of orbit to burn up in the earth’s atmosphere.”²²² Another idea is space tethering.²²³ A space tethering technique would deorbit debris by altering its orbital path by using a tether that would attach to the debris and move it, one piece at a time.²²⁴

Although the UN COPUOS mitigation guidelines propose viable options for mitigation, the following suggestions should be considered in a binding agreement. First, reducing the number of total objects on a space mission would decrease the number of items that could potentially be dropped in space or left behind as debris.²²⁵ Secondly, payloads should be deorbited at the end of their missions, rather than risk that they will stay in orbit for hundreds or thousands of years.²²⁶

218. *Id.* at 626. The General Assembly directed the Legal Subcommittee to do so in 2008, the same year it adopted the mitigation measures. *Id.*

219. *Id.* at 627.

220. *Id.* at 628. This is even truer of graveyard orbits in GEO, where GEO debris is deorbited, until a cleanup solution is implemented. *See id.*

221. Bird, *supra* note 2, at 644.

222. *Id.*

223. *Id.*

224. *Id.* A similar approach is to use nanosatellites to locate debris and attach to it, slowing the debris down so it will deorbit and burn up in the atmosphere. *Id.*

225. *See id.*

226. *Id.* at 644–45.

B. The Future Development of International Space Law and Space Debris

At the beginnings of space law, only two nations dominated this new frontier, the United States and Russia.²²⁷ Now, more than thirty countries have significant space industries, and eight have launch capabilities.²²⁸ The interest in space is growing, too, as many smaller nations are interested in the economic benefits space activity can provide, such as communications access.²²⁹ Because of this growing interest and involvement in space activity, current space law faces two scenarios for the future: “muddling through” or establishing a more elaborate regime.²³⁰

Under the first scenario, space law continues to muddle through, “continu[ing] its current practice of operating under diverse interpretations of nominally shared but vaguely specified principles, seeking incremental modifications to the existing regime where it can.”²³¹ This practice of creating rules as needed, without focus on a comprehensive regime, will not fully address the issue of space debris, nor will it provide for a uniform binding scheme to fix the problem in time.²³² The second scenario is that the United Nations implements a developed regime to deal with space debris.²³³ This approach would require the United Nations and UN COPUOS to negotiate rules desirable to all nations, spacefaring or not.²³⁴

The best option for UN COPUOS, then, is to develop a stronger, clearer, more uniform binding regime to deal with space debris specifically.²³⁵ Thus far, the muddling through approach has not adequately addressed space debris, since

227. See Tannenwald, *supra* note 87, at 381–82.

228. *Id.* at 381. Russia, the United States, and China have full space programs, while Europe, France, India, Israel, and Japan have satellite launch capabilities. *Id.* at 381–82.

229. *Id.* at 385.

230. *Id.* at 378. A discussion of U.S. dominance is excluded, as it is an unrealistic scenario within the scope of UN COPUOS.

231. *Id.*

232. See *id.* at 378–81.

233. See *id.* at 379.

234. *Id.*

235. See Imburgia, *supra* note 3, at 626; Tannenwald, *supra* note 87, at 412.

after nearly twenty years of consideration, UN COPUOS has only come up with a nonbinding set of mitigation guidelines, and still lacks a working definition of space debris.²³⁶

The first tenant of a new UN COPUOS space debris regime should include the “common heritage principle” that the LOS Convention used to compel a more responsible and equitable approach to space and space debris.²³⁷ Using the “common heritage principle” is not treated as a “mandatory legal obligation,” but is more of a political symbol of moral commitment that “promote[s] notions of stewardship.”²³⁸ This is important to instill in space law, and particularly a regime addressing space debris, in order to promote stewardship and a sense of urgency to protect outer space as a resource for all nations.²³⁹

Second, the regime should implement widely applicable laws, rather than ones that cater to spacefaring nations and powerful nations.²⁴⁰ Additionally, involving developing countries and non-spacefaring nations alongside the powerful spacefaring nations will ensure a well-rounded space policy.²⁴¹ Powerful spacefaring nations have the expertise, experience, and resources to lead and guide the discussion, but involving other nations ensures that policies will be applied evenly and equitably.²⁴² This would additionally encourage smaller nations that go into space to participate and adhere to the laws and policies.²⁴³

Third, a binding agreement is necessary to address the space debris problem with the urgency the situation requires.²⁴⁴ The Legal Subcommittee should determine that the existing treaties are insufficient to address the problem, and that a binding agreement that provides for clean up and mitigation is necessary.²⁴⁵ The binding agreement should encourage research on cleanup technologies, and a means of

236. See Imburgia, *supra* note 3, at 621–24.

237. See Tannenwald, *supra* note 87, at 412. For a discussion of the tragedy of the commons phenomenon, as it relates to space debris, see Bird, *supra* note 2, at 657–58.

238. Tannenwald, *supra* note 87, at 412.

239. See *id.*

240. See *id.*

241. See *id.*

242. Bird, *supra* note 2, at 650–52.

243. See *id.* at 652.

244. See Imburgia, *supra* note 3, at 626.

245. *Id.*

financing the research and cleanup, as well as require the tracking and sharing of information on space debris, filling in the holes of the Registration Convention.²⁴⁶

CONCLUSION

The current status of space law does not adequately address the urgent problem of space debris. UN COPUOS, as a central figure in space debris, must take the lead in shaping a binding policy to ensure continued access to space for all humankind. UN COPUOS successfully set forth binding treaties on spacefaring nations in the past, but is neglecting the issue of space debris. The best approach for the short term, in order to avoid a potentially devastating cascade effect, is to implement binding mitigation measures on spacefaring nations. Additionally, a long-term goal of researching cleanup methods would ensure access for several years to come, keeping Earth's orbit free and clear for future space travel.

246. *Id.* Funding cleanup research and removal is another issue that COPUOS will need to resolve. *See id.* at 629. One idea is to set up an international fund, administered by COPUOS that would collect and distribute money. *Id.* Future space missions would require the nation to pay a fee to the fund, while current debris would be taxed based on a market-share responsibility scheme. *Id.* at 629–30. This would prove costly to the United States in the short-term, but will pay off in the long-term when the cascade effect is no longer a concern. *Id.* at 630.