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Monetizing Space Debris: Getting Tax Credits On Board

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I. Introduction

Earning money is, and historically has been, a universal motivation for people. The pursuit of profit or financial gain can generate passion, dedication, ingenuity, as well as the willingness to undertake daunting and challenging tasks. For decades following humanity's ability to routinely access outer space, the extraterrestrial realm was the domain reserved mostly for governmental entities. A tremendous shift in this scenario has occurred within the last decade as the private sector has started making significant investment in ventures participating in the use, exploration and exploitation of outer space. Virtually all of the significant investments have been made in ventures engaging in commercial activities such as resource extraction and space tourism. However, this attention on the exotic commercial space activities tends to negate private sector focus on remedying the hazards associated with the emerging "tragedy of the commons"caused by space debris, especially orbital debris.[1]

A "tragedy of the commons" exists when "many individuals benefit from a collective resource but no one has an incentive to bear the cost of maintaining it."[2] In other words, an unmaintained collective resource will be over used and generally will be either thoroughly polluted, totally consumed or otherwise "thrashed." Consistent with this economic theory, a 2013 economic study by a trio of economists concluded that private space actors and governmental space actors both share strong "incentive to launch new satellites, but much less incentive to clean up the debris around them, even if it poses a threat."[3] The study also noted that space actors "'don't internalize the impact on themselves, and they definitely don't internalize the impact of the debris on other launchers.'"[4] Despite the adverse impact orbital debris poses on the use, exploration, and exploitation of space, the private sector is not heavily investing funds in the remediation of orbital debris. The reason for this circumstance appears to rest on the fundamental concept that "there is no profit in it."

Since the lack of return on investment negates private sector enthusiasm to fund or invest venture capital in enterprises engaged in orbital debris remediation, the burden for addressing this "tragedy of the commons" rests with the public sector. The growth in orbital debris during this period of public stewardship strongly suggests public sector oversight alone suffers from a lack of efficiency. Active private sector involvement in orbital debris removal should promote greater efficiency. This occurs because private actors are keenly attuned to market forces and "[m]arket actors promote efficiency because of the discipline imposed by the market profit

-and-loss system."[5] This need for a profit motive means it is necessary to monetize orbital debris remediation to attract private sector attention to and focus on the problem.

While there are various means for monetizing space debris removal, one such avenue involves establishing a financial incentive through the extension of tax credits. As examined below, tax credits may present a viable mechanism for attracting private sector ingenuity and enthusiasm to the imminent, arduous and necessary task of extracting orbital debris.

II. Taxation and Governmental Policy

The dislike for taxation has a long history in the United States as it is one of the motivating basis for the country's founding. Indeed, the slogan "[n]o taxation without representation" is embedded in the teaching of American history. Although taxation is now imposed by elected representatives, it seems taxation is assessed as a solution for many significant governmental undertaking for the common good. This view of taxation as the cure for a problem or to modify private sector behavior has surfaced in connection with orbital debris remediation. For instance, it has been suggested that the United States should levy a tax on satellite launches to generate revenue for governmental efforts to remove orbital debris or to mitigate the creation of new debris by modifying the behavior of private sector space actors.[6] Since the use and exploration of space is a partnership between the government and the public sector, allocating some governmental financial resources to combat orbital debris is reasonable especially given NASA's shrinking budgetary allotment.[7] Imposing and collecting a tax on space actors, however, should not be the mechanism for or source of the government's allocation of financial resources to address the problem.

Assessing a tax on satellite launches should not be the source of governmental funding for orbital debris remediation. Instead, consideration should be focused on implementing tax credits as the potential source for the government's financial contribution to remedying the orbital debris problem. Tax credits should not only serve to spur private sector investment associated with developing and, most importantly, implementing technology and procedures for removal and/or mitigation of space debris, but they are also consistent with the government's obligation under the Space Resource Exploration and Utilization Act of 2015 ("Space Resource Act of 2015").[8] Among other things, the Space Resource Act of 2015 mandates that the government: 1) facilitate commercial activities of U.S. citizens engaged in the exploration and recovery of space resources, and 2) discourage government barriers to American companies developing "economically viable, safe, and stable industries" for the exploration and recovery of space resources for commercial purposes.[9] Tax credits associated with orbital debris remediation, therefore, can assist in satisfying an express governmental policy relating to the commercial use, exploration, and exploitation of outer space.

III. Brief Overview of Business Tax Credits

Tax credits are different from tax deductions although they both are means to reduce

income tax liability. Deductions reduce income tax liability by a percent of the taxpayer's tax bracket. Tax credits, on the other hand, reduce income tax liability on a dollar for dollar basis. Credits cannot, however, reduce a taxpayer's income tax liability below zero. Whether the unused tax credits available in a particular year can be carried over for use in subsequent years is a benefit Congress, in its discretion, can allow in the legislation creating the tax credit.[10] In any event, tax credits are always preferable to tax deductions for purposes of spurring investment or other economic activity.

Investment tax credits assists in stimulating commercial activity because entrepreneurs and innovators are often not in a position to make use of tax benefits such as depreciation deductions and research and development tax credits to any significant degree. Thus, governmental allowance for "tax equity investors" can spur growth and maturation of designated commercial or economic activity by allocating tax credits for tax equity investors in exchange for their monetary investments in specified enterprises.[11]

The use of tax credits to spur private sector investment is said to have commenced in 1962 when Congress enacted the "first federal tax credit aimed at encouraging capital investment."[12] The legislation's intent, among other purposes, was meant to strengthen United States companies competing with foreign companies in world markets.[13] Since enactment of the initial business investment tax credit, Congress has enacted a plethora of tax credit legislation designed to utilize private sector expertise and ingenuity to spur various governmental policies. Such legislation has targeted various governmental policies which include but are not limited to encouraging the development of renewable energy technology,[14] revitalizing areas afflicted with economic decay,[15] developing economically depressed areas,[16] and research and development.[17]

IV. Tax Credits and Outer Space Activity

Congress has not yet enacted tax credits or other financial incentives specifically aimed at spurring private sector investment in outer space ventures or activities.[18] Generally, this is because until recently, "most space companies have primarily operated as government contractors rather than true commercial enterprises."[19] Tax credits are not an incentive for government contractors as government contractors basically operate on a cost plus basis and do not incur "real financial risks as all their expenses are covered by a space agency or defense department."[20] Nevertheless, the absence of tax credits oriented toward commercial activity in the extraterrestrial realm does not result from the lack of congressional opportunity to consider such legislation.

In 2001, a bill known as the Invest in Space Now Act of 2001[21] was introduced in the House of Representatives. The bill sought to amend the Internal Revenue Code to allow a tax credit for purchasing stock in a "qualified space transportation vehicle provider."[22] The primary purpose of the bill was "to ensure availability of otherwise unavailable private sector equity financing for United States private sector development of commercial space transportation vehicles which will have transportation costs significantly below current levels."[23] The anticipated residual effects of achieving that goal included: 1) avoiding undue reliance on foreign space transportation services, 2) substantially reduce governmental space transportation

expenditures, 3) enhance the international competitiveness of U.S. space industry, 4) encouraging U.S. business expansion in domestic and international commerce relating to outer space and 5) giving the American people greater access to the space frontier.[24]

Nothing of substance happened with the Invest in Space Now Act of 2001 and it "died" as Congress failed to act on it prior to expiration of the 107th Congress. The bill was reintroduced in the 108th Congress as the Invest in Space Now Act of 2003.[25] The reintroduced bill was virtually identical to its predecessor.

The 2003 bill provided for a tax credit in an "amount equal to the applicable percentage of the aggregate amount paid by the taxpayer during the taxable year for the purchase of qualified space transportation vehicle provider stock."[26] It capped the credit at fifty percent (50%) for the first three years (2004, 2005, and 2006) with a five percent (5%) decrease annually for the next three years (2007, 2008, and 2009) and leveling off at twenty percent (20%) for the next two years (2010 and 2011) with no credit allowed after 2011.[27] The proposed legislation capped the annual tax credit amount with different maximum amounts for a Large Capitalization Provider ("LCP") and a Small Capitalization Provider ("SCP").[28] The maximum annual cap for a single LCP was $50 Million for 2004, $100 Million for 2005, $125 Million for 2006, $175 Million for 2007, $200 Million for 2008, and $50 Million for 2008 and 2009 with no credit allowed for 2010 or 2011.[29] A SCP's maximum annual credit amount was $35 Million for 2004, $40 Million for 2005, $45 Million for 2006, $50 Million for 2007and 2008, $40 Million for 2009, and $35 Million for 2010 and 2011.[30] Furthermore, the bill set an aggregate limit on the annual tax credit allowed for LCPs and SCPs combined. The annual aggregate limits were $395 Million for 2004, $580 Million for 2005, $690 Million for 2006, $875 Million for 2007, $950 Million for 2008, $430 Million for 2009, $245 Million for 2010 and 2011.[31] Lastly, the bill contained a provision for recapturing used tax credits if the LCP or SCP failed to hold qualified space transportation vehicle provider stock for the required three years.[32]

The bill defined a "United States commercial space transportation vehicle provider" as a company "engaged in designing, developing, and producing commercial space transportation vehicles." A "space transportation vehicle" was defined to include:

> ...all types of vehicles, whether now in existence, developed in the future, or currently under design, development, construction, reconstruction, or reconditioning, which are constructed in the United States by a United States commercial provider and owned by the commercial provider, for the purpose of operating in, or transporting a payload to, from, or within, outer space, or in suborbital trajectory.[33]

Like its predecessor, the 2003 bill did not gain any traction and, "the bill did not pass."[34]

There was also the Zero Gravity, Zero Tax Act legislation which followed a path similar to the Invest in Space Now Acts. The Zero Gravity, Zero Tax Act was initially introduced in 2000.[35] The initial version of the proposed legislation sought to exclude "space-related income" from the Internal Revenue Code's definition of gross income.[36] "Space related income" was defined to mean: 1) income derived from the sale of items manufactured in space[37] 2) income derived from the sale of services in or from space, 3) "income of an individual attributable to

services performed in or from outer space by such individual in a trade or business"[38] and 4) any "gain on the sale or exchange of any stock of a qualified space corporation."[39] Sales between related parties were not eligible for the exclusion.[40] Similarly, the exemption for sale of services did not apply to a sale of telecommunication services, or "any service provided by a weather or other earth observation satellite, and any service of transporting property to or from outer space."[41].

The Zero Gravity, Zero Tax Act of 2000 did not become law. It was subsequently revised and reintroduced in 2001,[42] 2003[43] and 2005.[44] The 2001, 2003 and 2005 versions were virtually identical. They retained the exclusions from gross income contained in the 2000 version but clarified that employee wages were not eligible for the exclusion from gross income.[45] They also added an investment tax credit for purchasing stock in a qualified space company.[46] Like the Zero Gravity, Zero Tax Act of 2000, the 2001, 2003 and 2005 versions of the legislation did not become law.

Similarly, in 2010, the Commercial Space Jobs and Investment Act of 2010 was introduced in the Senate.[47] It sought to amend the Internal Revenue Code to provide three different tax credits. The three tax credits were for: 1) any equity investment in a qualified commercial space entity, 2) expenses incurred in connection with qualified commercial space research, 3) expenses incurred in connection with a commercial space educational assistance program.[48] Each of the credits had a sunset provision of December 31, 2019.[49] The proposed legislation did not become law.

Although Congress has not yet enacted any tax credit legislation expressly for outer space activity, private sector space actors can avail themselves of terrestrial oriented tax credits which can apply to space activities. One such tax credit is the Research and Development R & D) Tax Credit.[50] The R & D tax credit was enacted for a two-year period in 1981 but was continuously renewed and extended until it becoming permanent in 2015.[51] The R & D tax credit seeks to provide incentives for and to reward U.S. companies for increasing investment in research and development during the current year.[52] A U.S. business can avail itself of the R & D tax credit by attempting to "develop new, improved, or technologically advanced products or trade processes or by creating new products or trade processes."[53] Additionally, a taxpayer may use the R & D tax credit if, during the tax year, the taxpayer "improved upon the performance, functionality, reliability, or quality of existing products or trade processes."[54]

Although space actors can potentially avail themselves of the R&D Investment tax credit in connection with commercial space activities, it has not generated a rush of investment relating to commercial debris remediation. The apparent lack of enthusiasm among private sector actors for engaging in active orbital debris extraction strongly suggests that the R&D Investment tax credit is an insufficient incentive.

Space oriented tax credits previously introduced in Congress failed to produce sufficient legislative interest which indicates the time apparently was not ripe for such legislation. The enactment of the U.S. Commercial Space Launch Competitiveness Act, which contains the Space Resource Extraction Act of 2015[55] and other provisions, may reflect a change in the legislative perspective. Thus, the time may now be ripe for Congress to seriously entertain legislation specifically allowing tax credits for investment in and development of commercial enterprises seeking to actively engage in certain outer space ventures, especially ventures that will extract or

harvest orbital debris. For sure the uniqueness of and risks associated with extraterrestrial commercial activity justify granting tax credits for private space actors, especially those actively engaged in the commercial extraction of orbital debris.

V. Tax Credits as an Incentive for Orbital Debris Removal

The Invest in Space Now Act of 2003 provides a blueprint for space oriented tax credit legislation. Since the 2003 bill is almost 16 years old,[56] it will need some modernizing but its substantive framework can serve as the foundation for developing substantive content tailored specifically for tax credits associated with orbital debris remediation.

A review of the Invest in Space Now Act of 2003 reveals that the tax credits had a sunset provision which gave it an eight (8) year life span. During the projected eight (8) years, the annual investment percentage allowed as a tax credit had a declining sloop while the annual credit amount available for a single taxpayer and the annual aggregate credit limit for all eligible taxpayers each had a parabolic shape. The proposed legislation also tiered eligible taxpayers into two different categories, LCPs and SCPs, based on the minimum investment amount with the amount of annual tax credit available dependent upon which investment category applied to the taxpayer. Lastly, the bill contained a recapture provision which provided for the government recouping the amount of used tax credits if the taxpayer failed to satisfy its end of the bargain.

This scheme or structure presents a skeleton outline for legislation seeking tax credits aimed at generating private sector investment in extracting or harvesting orbital debris. However, while a detailed analysis and recommendation for each of the above components are beyond this paper's scope, a brief overview of the various substantive components of such legislation is appropriate.

Life Span

The 2003 legislation sought an eight (8) year life for tax credits associated with space transportation vehicles. Needless to say, orbital debris removal is a far more complex and time-consuming venture. Determining a feasible sunset date for the tax credits is appropriately left to the industry experts and legislators. In any event, prudence suggests that the temporal period may have to be thought of in terms of decades as opposed to years. For sure, orbital debris removal involves "cleaning-up" more than sixty (60) years of junk.

Annual Investment Percentage Allowed as a Tax Credit

Proposed tax credits for an investment in space transportation vehicles set fifty percent (50%) of the qualified investment as the highest percent for a tax credit. This maximum applied for the first three (3) years and thereafter had a declining percentage and eventually bottoming

out at zero percent (()%) for the last two years. With respect to orbital debris removal, the tax credit should initially "be set at a high value to provide a strong incentive for third parties to develop feasible space debris removal technology" as well as engage in active debris removal.[57] The lack of private sector interest in extracting or harvesting orbital debris suggests that the initial tax credit percentage should be significantly higher than fifty percent (50%). How much higher is a matter best left to agreement or compromise among industry experts, tax experts, government officials and legislators.

Caps on the Annual and Aggregate Amount of the Tax Credit

Ideally, for the first few years after enactment of the legislation, there should not be a cap on the annual amount a taxpayer can claim as a credit or on the aggregate amount all eligible taxpayers can claim as a credit. Unfortunately, we do not live in an ideal world. Thus, if caps are necessary, then the legislation should allow a taxpayer to carryover any unused tax credits to succeeding years until all the credits have been claimed. Even more so, the legislation should allow the creation of secondary markets by permitting the sale, transfer or other conveyance of all or a portion of a taxpayer's annual tax credit.

Recapturing a Used Tax Credit

The 2003 bill provided for recapturing used tax credits if the taxpayer failed to satisfy the applicable criteria by increasing the taxpayer's tax liability in the next tax year by the amount of tax credits previously obtained by the taxpayer.[58] Although this recapture arrangement is reasonable, the dollar amounts associated with orbital debris remediation suggest some stronger recapture measures may be necessary to adequately protect the public's financial investment.[59] Such measures can consist of the government obtaining a lien on certain of the taxpayer's assets, a bonding requirement to secure recapture, if necessary, or some other form of security. This would not only protects the public's interest and investment given the high dollar amounts associated with the tax credits, but it can also serve to ensure that only responsible investors receive the tax credit benefits.

Classification of Eligible Taxpayers

Establishing different categories of investors based on the amount and type of investment is a better approach than a "one size fits all" scheme. This not only allows for participation by responsible startups but can also expand the legislation's reach to include private satellite operators and others who may hire an orbital debris remover.[60]

Other Provisions

There are numerous other provisions which any proposed space oriented tax credit legislation should contain which include, but are not limited to, identifying the purpose and multiple governmental policies which support the tax credits, defining of terms, specifying the scope of work and/or activity necessary for the tax credits and setting forth the means for the taxpayer to show compliance with its obligations. Moreover, eligibly for such credits should obligate the taxpayer to disclose its plan for disposing of the harvested debris. This requirement may serve to spur development and deployment of other commercial ventures such as the deployment of orbiting recycling platforms. The details of such provisions, like all of the above discussed components, should be developed and refined by collaboration amongst industry experts, tax experts, governmental officials and legislators.

VI. The Title Problem and a Potential Solution

If Congress enacts tax credit legislation relating to extracting orbital space debris, then the Outer Space Treaty[61] presents a fundamental problem in connection with lawfully harvesting orbital debris.

Pursuant to Outer Space Treaty Article 8, "[o]wnership of objects launched into outer space ... is not affected by their presence in outer space ..." While the Outer Space Treaty does not define the term "space object," it is defined by the Liability Convention.[62] Article 1(d) of the Liability Convention defines the term "space object" to include "component parts of a space object." According to this definition of "space object," a non functional space object as well as each item or part which separates from a space object, remains the property of the owner of the space object at the time of launch or any lawful successor in the ownership interest. This means that orbital debris is never deemed to be abandoned property available for salvage as the owner of a space asset does not lose title to the asset regardless of how long the object or a component part of the object remains in outer space, even if it constitutes orbital debris.[63] Thus, to avail itself of any tax credit for extracting orbital debris, a company must first obtain title to the space debris or alternatively obtain the owner's consent to harvest the debris. This imposes a substantial barrier to a private entity lawfully harvesting space debris as well as the viability of tax credits for extracting debris from orbit. United States law, however, provides a potential resolution to this dilemma for orbital debris owned by a U.S. citizen or in which the United States is the registered State.

The Space Resource Act of 2015 allows the United States to license its citizens to engage in the commercial extraction of space resources.[64] A space resource is defined as an "abiotic resource in situ in outer space" which includes but is not limited to water and minerals."[65] Noticeability, the U.S. legislation does not limit its application to natural resources. This broad definition indicates that "space resource" extends beyond natural resources and can encompass resources which are of artificial origin. Indeed, orbital debris is abiotic as it is not alive and has never been alive. Thus, to the extent space debris can serve as a basis for a commercial or financial benefit, it has been monetized therefore meaning it can be classified as a space resource

within the definition of U.S. law and accordingly be subject to commercial recovery pursuant to a license issued by the United States.

However, as previously noted, under the Outer Space Treaty, an owner of a space object or part thereof located in space is not divested of title simply because the property or part thereof has become orbital debris. This title problem can potentially be addressed by the United States exercising its sovereign power to take title to private property.

The United States possesses the sovereign power to take property, real or personal, or any item amounting to a property right, without consent of the person having ownership or possessory rights. Such a taking is generally achieved pursuant to the eminent domain power or police power. An eminent domain taking occurs when the government takes private property for a public purpose and the Fifth Amendment to the United States Constitution mandates payment of just compensation for the taking. When the United States exercises its police power to take private property, the taking is not for a public purpose and the Fifth Amendment's requirement for just compensation is inapplicable. A governmental taking of private property pursuant to its police power needs to comport with the Fifth Amendment's due process requirement which is usually satisfied by complying with the statutory procedures governing forfeiture of the targeted private property. The United States, therefore, possesses the sovereign power to take title to orbital debris which is subject to its jurisdiction provided it can satisfy the prerequisites for either eminent domain or the exercise of its police power.

To effectuate an eminent domain taking the United States essentially has to show the taking is for a public purpose and pay just compensation. Moreover, a public purpose taking can be exercised to "transfer property from one private party to another if future 'use by the public' is the purpose of the taking."[66] A public purpose is construed very broadly and can evolve over time in accordance with changed circumstances and societal needs.[67] Hence, the United States can exercise its domain powers to transfer title of the space debris to which it is the licensing state to a licensed space resource extractor if Congress can reasonably articulate that the transfer is for a public use and the government pays the owner just compensation for the taking.[68]

Alternatively, the United States can use its police power to take title to orbital debris subject to its jurisdiction. Police power connotes the government is acting to protect the general health, safety and welfare of its citizens.[69] It is more practical and expeditious for the United States to wield governmental police power to take title to orbital debris subject to its jurisdiction. This route avoids any potential dispute over what is "just compensation" and eliminates justifying that the taking is for a public purpose. Moreover, societal dependence on space based assets can translate into orbital debris extraction being necessary for the general safety and welfare as Congress seemingly recognizes in the Space Act of 2015 and the President acknowledges in Space Policy Directive--4[70] issued on February 19, 2019 which creates the U.S. Space Force.

A reasonable and legitimate argument exists that the United States can fashion a basis for taking title to orbital debris subject to its jurisdiction by using its eminent domain power or its police power. Since a police power taking is more expeditious and much less costly then reliance on eminent domain, it is more practical to wield governmental police power to take title to orbital debris subject to its jurisdiction. For instance, the Space Resource Extraction Act of 2015 vests the Secretary of Transportation with authority to "protect public health and safety, safety of

property, national security interests, and foreign policy interests of the United States" in connection with the commercial launch and reentry operations.[71]

Similarly, Space Policy Directive - 4 identifies the United States priorities being: 1) protecting the United States interests in space, 2) "**[e]nsuring unfettered use of space** for United States national security purposes, the United States economy, and United States persons, partners, and allies," and most importantly, "**[p]rojecting military power in, from, and to space in support of our Nation's interests**."[72] It is undisputed that orbital debris poses a hazard to: 1) safety 2) the public welfare, 3) the national security interests of the U.S., and 4) the United States foreign policy interests. Thus, legislative and executive branch policies exist which justify a police power taking of title to orbital debris subject to U.S. jurisdiction. While a governmental taking of any kind of private property should only be used a last resort, there does not appear to be any other viable reasonable alternative for the United States to provide for an orderly and systematic extraction of orbital debris subject to its jurisdiction.

CONCLUSION

It is said that there is nothing harder to stop than an idea whose time has come. It cannot be disputed or denied that the time has now arrived for active harvesting of orbital debris to ensure the continual unfettered access to and the use, exploitation and exploration of outer space. The volume of space debris will not stagnate especially since there is no foreseeable decrease in the number of space launches which will traverse Earth's gravity barrier and deploy new objects in orbit. While there has been marginal progress with mitigating the creation of new orbital debris arising from the decommissioning of satellites, much talk and little substantive action comprise the emerging legacy for extracting orbital debris.

To date, it has been a governmental obligation to address the orbital debris problem which is consistent with the United States international obligations relating to the use and exploration of outer space. However, the lack of progress with the actual removal of orbital space debris demonstrates the importance of establishing a true public/private partnership with the sole focus on extracting orbital debris. This necessitates monetizing space debris extraction to attract the attention, energy and focus of prospective investors, startup firms and established actors in the space industry. As discussed and examined above, tax credits are one-means of monetizing the extraction of orbiting debris.

FOOTNOTES

1.Robert P. Merges, Glenn H. Reynolds, Rules of the Road for Space?: Satellite Collisions and the Inadequacy of Current Space Law, 40 Envtl. L. Rep. News & Analysis 10009, 10011 (2010)["At present, the space-debris problem is a classic tragedy of the commons."]. Last visited on January 29, 2019. The magnitude of the orbital space debris problem is well known and documented so there is not any need to re-hash such information.

2. Sarah Laskow, "The economics of space junk," at 2, bostonglobe.com, https://www.bostonglobe.com/ideas/2013/10/12/the-economics-space-junk/ARGKnCkIKMnzGyi63HpPHM/story.html (October 13, 2013). Last visited on January 29, 2019.

3. *Id*.

4. *Id*., quoting Brendan Cunningham, an economics professor at the US Naval Academy

5. Alexander William Salter, Space Debris A Law and Economics Analysis of the Orbital Commons, at 11-12, Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, (September 2015), https://www.mercatus.org/system/files/Salter-Space-Debris.pdf (Last visited January 29,2019)

6.Joshua Keating, "Do We Need a Tax on Space Junk to Keep Gravity From Coming True?", slate.com, https://slate.com/news-and-politics/2013/10/taxing-satellite-launches-to-prevent-space-debris.html (Last visited on January 29, 2019); Brad Plumer, "Space trash is a big problem. These economists have a solution.," washingtonpost.com (October 24, 2013) https://www.washingtonpost.com/news/wonk/wp/2013/10/24/space-is-filling-up-with-garbage-heres-why-we-should-tax-it/?noredirect=on&utm_term=.68e6cd338c82 (Last visited January 29, 2019); Laskow, supra note 2. Some refer to such a tax as a Pigouvian tax or user fee . *See* Alexander William Salter, Space Debris A Law and Economics Analysis of the Orbital Commons, at 11-12, Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, (September 2015), https://www.mercatus.org/system/files/Salter-Space-Debris.pdf (Last visited January 29,2019)

7.NASA's percentage of the U.S. budget has been steady shrinking since the 1960s. See Charles R. Goulding, Robert Goulding, and Jennifer Reardon, The R & D Tax Credit Aspects of the Commercialization of Space, rdtaxsavers.com (2019) http://rdtaxsavrs.com /articles/Space (Last visited January 28, 2019).

8. 51 U.S.C. §§ 51301 - 51303. The Space Resource Act of 2015 is a part of the U.S. Commercial Space Launch Competitiveness Act, P.L. 114-90, 129 Stat 704 (November 25, 2015).

9. 51 U.S.C. §51302.

10. If Congress does not allow an unused tax credit to be carried over to subseqent years, then the unused portion of a tax credit lapses and for the

11. Thomas W. Giegerich, "The Monetization of Business Tax Credits," 12 Florida Tax Review 709, 769 (2012)

12. *Id*., at 720.

13. *Id*. President Kennedy explained that the legislation had the purpose of stimulating "investment in capacity expansion and modernization, contribute to growth of our productivity and output, and increase the competitiveness of American exports in world markets." *Id*., at 720-721.

14. 26 U.S.C. §48.

15. 26 U.S.C. §48. *See* Thomas W. Giegerich, The Monetization of Business Tax Credits, 12 Fla. Tax Rev. 709, 724–725 (2012)[The Rehabilitation Tax credit aims to "promote greater stability in the economic vitality of areas that have been developing into decaying areas."]

16. 26 U.S.C. §45d

17. 26 U.S.C. §41.

18.Eva Jane Lark, Economic Incentives and Tax Credits for Space Resource Development, at 4, (October 2010) published at http://ssi.org/2010/SM14-proceedings/Economic-Incentives-and-Tax-Credits-for-Space-Resource-Development-Lark.pdf (Last visited on January 29, 2019).

19. *Id*.

20. *Id*.

21. Invest in Space Now Act of 2001, H.R. 2177, 107th Congress (2001-2002).

22. *Id*., § 5A

23. *Id*.,§3(1).

24. *Id*,,§3(2)

25. Invest in Space Now Act of 2003, H.R. 2358, 108th Congress (2003-2004).

26. *Id*., § 5A.

27. *Id*,§54(a)(2)

28. *Id*,,§54(b). The Secretary of Transportation was delegated the task of establishing guidelines for the LCP and SCP classifications. *Id*,,§54(c)(3)(B)

29. *Id*,,§54(b)(1)(A)

30. *Id*,§54(b)(1)(B)

31. *Id*,§54(b)(2)

32. *Id*,§54(d)

33. *Id*., § 4(3).

34.Tanya Lewis, IRS in Space: How Will We Tax a Mars Mission?, Space.com (/April 4, 2015).

35. H.R. 3898 — 106 Cong.

36. H.R. 3898 §2 seeking to enact a new 26 U.S.C. §139(a)

37. *Id*., seeking to enact a new 26 U.S.C. §139(b)(1)(A)(i)

38. *Id*., seeking to enact a new 26 U.S.C. §139(b)(1)(B)

39. *Id*.,seeking to enact a new 26 U.S.C. §1203(a)

40. *Id*., seeking to enact a new 26 U.S.C. §139(b)(1)(A)

41. *Id*., seeking to enact a new 26 U.S.C. §139(b)(2)

42. H.R.2504 — 107th Congress (2001-2002)

43. H.R.914 — 108th Congress (2003-2004)

44. H.R. 1024 — 109th Congress (2005-2006)

45. See H.R. 2504 §3 seeking to enact a new 26 U.S.C. § §139(b)(3); H.R. 914 §3 seeking to enact a new 26 U.S.C. § §139(b)(3); H.R. 1024 §3 seeking to enact a new 26 U.S.C. § §139(b)(3)

46. H.R. 2504 §3 seeking to enact a new 26 U.S.C. §45G; H.R. 914 §3 seeking to enact a new 26 U.S.C. §45G; H.R. 1024 §3 seeking enact a new 26 U.S.C. §45J

47. Senate Bill 3785 - 111th Congress (2009-2010)

48. *Id*., §2 seeking to enact a new 26 U.S.C. §30E, §3 seeking to amend 26 U.S.C. §41(b). It also allowed a depreciation deduction for certain commercial space property. *Id*., §4 seeking to amend 26 U.S.C. §168.

49. *Id*., §2 seeking to enact a new 26 U.S.C. §30E and §3 seeking to amend 26 U.S.C. §41(b).

50. Goulding, Goulding, and Reardon, *supra* note 2, The R & D Tax Credit Aspects of the Commercialization of Space at 2 - 6.

51. Yair Holtzman, U.S. Research and Development Tax Credit, The CPA Journal, cpajournal.com (January 2019) https://www.cpajournal.com/2017/10/30/u-s-research-development-tax-credit/ Last visited on January 28, 2019

52. *Id*.

53. *Id*.

54. *Id*.

55. *See* note 8.

56. It was introduced in the 108th Congress in June, 2003.

57. Jared B. Taylor, Tragedy of the Space Commons: A Market Mechanism Solution to the Space Debris Problem Shearman & Sterling Student Writing Prize in Comparative and International Law, Outstanding Note Award, 50 Columbia Journal Transnational Law 253, 276 (2011)

58. 108th Congress, H.R. 2358 §54(d),

59. The tax credits should be viewed as the public's investment in orbital debris removal.

60. Jared B. Taylor, *supra*, note ___, 50 Colum. J. Trans. L. at 253.

61. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, entered into Force Oct. 10, 1967, 18 UST 2410; TIAS 6347; 610 UNTS 205; 6 ILM 386 (1967)

62. Convention on International Liability for Damage Caused by Space Objects entered into Force Sept. 1, 1972, 24 UST 2389; TIAS 7762; (961 UNTS 187; 10 ILM 965 (1971)

63. A "space object" is defined as including the component part of a space object. Convention on International Liability for Damage Caused by Space Objects, Article 1(d), 961 UNTS 187; 4 UST 2389; 10 ILM 965 (1971).

64. 51 U.S.C. § 51303.

65. *Id*., §51301(1)&(2)

66. *Kelo v. City of New London, Conn*., 545 U.S. 469, 477 (2005)

67. *Id.,* at 483.

68. *Id.*, at 477-490. Congress' growing awareness of the STM need to reduce, if not eliminate, space debris suggests that Congress can advance a logical articulation for why taking and transferring title to space debris to a licensed space resource extractor is for a public purpose.

69. *Akins v. U.S.*, 82 Fed. Cl. 619, 622 (Fed. Cl. 2008).

70. Space Policy Directive-4: Establishment of the United States Space Force published at https://www.whitehouse.gov/presidential-actions/text-space-policy-directive-4-establishment-united-states-space-force/

71. P.L. 114-90 §113(b)(3).

72.