# The ITU's Evolving Regulatory Role for Space Debris 'Rules of the Road': Implications for Space Communications Regulation*

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The goal of this paper is to examine from the theoretical perspective of principal-agent theory the question whether the International Telecommunication Union (ITU) will become the lead international regulator for space debris management. The ITU is already the UN's inter-governmental organization (IGO) authorized by its member states to function as the primary regulator for management of radio frequency spectrum for space telecommunications, a function that also encompasses a limited delegation of regulatory authority over satellite locations in the geostationary orbit (GSO). As part of this GSO regulatory function, the ITU has developed and implemented rules requiring that operators boost their aging satellites into "graveyard" orbits at the end of their engineering lifetimes. "Dead" satellites behave as "space debris," in effect making the ITU perhaps the leading international regulator for space debris regulation and management in the GSO. Will member states expand the ITU's GSO space debris management function to other orbital regions? Applying principal-agent (P-A) theory, it would appear consistent with the theory's logic of task delegation that countries seeking to address the growing space debris problem would be incentivized to expand the ITU's present geostationary jurisdiction into other orbital realms. P-A theory identifies not only the incentives for task delegation that have in the past contributed to the ITU's longevity and legitimacy, but also how the factor of cyberconflict is emerging as an increasingly salient factor in global power competition eroding those incentives for an expanded ITU space debris regulatory role.

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* This paper is part of an on-going research and publication project. Earlier findings were orally presented at the 2013 Pacific Telecommunications Conference, January 22, 2013 in Honolulu, HI, the Santa Barbara Global Studies Conference, February 23, 2013 at UC Santa Barbara, CA, and at the 2013 Annual Meeting of the International Studies Association on April 4, 2013 in San Francisco, CA.

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## I. Introduction

In a larger perspective, space debris and cyber-conflict pose issues that directly challenge not only long-standing ITU jurisdictional competencies and intergovernmental relationships, but the foundational bedrock of the entire outer space legal regime as well. The four outer space treaties, a product of Cold War governmental dominance of the space realm, assigned rules delimiting military applications while stipulating rules for state-based ownership, control, and liability, that, in many regards, are out of date in an increasingly diverse, crowded, commercial, and conflicted space environment. As a consequence, the ITU, facing rapidly evolving challenges for outer space and cyberspace governance, must now seek the legal authorizations to shift the ITU's mission. These are promulgated through periodic revisions to the organization's constitutive and administrative instruments, revisions that notably failed to gain passage at the December 2012 World Conference on International Telecommunication held in Dubai. This paper utilizes a principal-agent theoretical framework to illuminate factors re-shaping the ITU's organizational structures, as well as the ITU's evolution as a UN specialized agency in an increasingly cyber-conflicted international system. The research question being asked, 'will the ITU's member countries delegate additional authority to the organization for the management of space objects beyond its current mandate for the geostationary region?' examines both the utility of principal-agent theory in the highly anarchic international environment as well as the debates about the future of the outer space international legal regime.

Space debris is about governance in a highly anarchic environment – the international system. International relations theory attempts to explain and predict the behaviors of major actors in the international system as they act and react to a constantly changing set of constraints and opportunities in an anarchic 'self-help' setting. Advances in transport and telecommunications technologies have brought states and commercial entities into ever closer interaction, a process often designated as "globalization," but rarely defined in terms of governance within highly anarchic realms of the international system. Does technological globalization require a fundamental re-working of international relations theory as well?[1] This paper seeks to answer this question by addressing one of the most vexing and far-reaching technological issues to face a globalized international system - space debris – through a theoretical perspective adapted from free market (an analogous anarchic setting) economics – principal-agent theory.

1 See, Ian Clark. (1999) *Globalization and International Relations Theory*. Oxford: Oxford University Press.

**Theoretical Framework: Principal-Agent Theory**

The space debris governance issue points to the continuing relevancy of one of the basic questions that differentiate various flavors of international relations theory: "do institutions matter?" While realists express a deep-seated skepticism about the efficacy of international or inter-governmental organizations (IGOs) as actors on the stage of international governance, liberal theorists point out that IGOs do indeed exist and are assuming ever-larger roles required by the quickening pace of globalization. On a theoretical level, we can analyze the realist-liberal debate about the relevancy of IGOs through the lens of principal-agent (P-A) theory. In their much cited 1991 book, *The Logic of Delegation*, Roderick Kiewiet and Mathew McCubbins outline how the logic behind P-A theory can predict when principals (i.e., states) under certain conditions choose to delegate tasks to agents (i.e., IGOs) rather than addressing the issues themselves.[2] We can analyze the (dis)incentives for states to oppose or support legal-organizational approaches to the space debris issue from the principal-agent theoretical perspective by posing the question: Does the International Telecommunication Union (ITU) matter?[3]

Open competitive markets and the international system of sovereign states both share characteristics of anarchy, i.e., high degrees of actor freedom in a 'self-help' setting. Such is the province and challenge facing those seeking to explain and predict behaviors of both states in the international system and of firms operating in free markets. When will sovereign or autonomous entities collaborate? In the 1930s, Ronald Coase's theory of the firm illuminated the (dis)incentives for otherwise autonomous entities to delegate functions rather than perform them themselves.[4] While it is certainly possible for an individual to completely build a house themselves with directly controlled internal transactions and hiring, under most conditions, as Coase points out, it makes more economic sense to delegate the house-building tasks externally to specialists whose opportunity costs are lower. In essence, the individual has constructed a firm whose existence is justified by economies of scope and scale, and whose operation is regulated by coordination mechanisms (management) backed by legally binding arrangements (contracts). Nobel Laureate Oliver Williamson's research into transaction cost economics and governance points to an

2 Roderick Kiewiet and Mathew McCubbins. (1991) *The Logic of Delegation: Congressional Parties and the Appropriation Process*. Chicago: University of Chicago Press.

3 See, Darren G. Hawkins, et. al., "Delegation under anarchy: states, international organizations, and principal-agent theory," in Darren G. Hawkins, et. al. (eds.) *Delegation and Agency in International Organizations*. Cambridge: Cambridge University Press, 2006, pp. 4-5.

4 See, Elinor Ostrom (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press, pp. 40-41; and, "The Nature of the Firm," (<http://en.wikipedia.org/wiki/The_Nature_of_the_Firm>, access March 25, 2013).

analogous set of circumstances that underlie the establishment of international organizations by sovereign nation-states.[5] Strong incentives for efficient management of collective problems in an anarchical environment overcome states' reluctance to lose aspects of sovereignty. P-A theory is but one of several ways of thinking about commons governance that utilize insights derived from economic analytical frameworks – public choice, tragedy of the commons, and "commons-based peer production" – representing other "economics-based" theoretical perspectives. Milton Mueller in his book, *Networks and States: The Global Politics of Internet Governance*, points out how "commons-based peer production" of open source software actually contributes significantly to Internet governance. Analogously to the generation of open source software distributed through the Internet, each user (whether governmental or private) of the outer space environment would "contribute" to the mitigation of space debris. In highly anarchic "commons" environments such as cyberspace or outer space, governance is "produced" by users incentivized by the very visible externalities. As the term "peer" implies, Mueller's "commons-based peer production" model leans strongly towards "horizontal" production of governance, while P-A theory relies on a more "top-down" configuration.[6]

To reiterate, P-A theory examines factors that explain and predict when states (principals) will delegate certain tasks to IGOs (agents) rather than addressing these issues directly themselves through bilateral or multilateral actions. However, once such delegations of authority have taken place, P-A theory also investigates the strategies and actions by the states to control the IGOs.[7] As the inter-governmental entity most directly authorized to regulate access and use of the increasingly congested geostationary orbit, the question arises whether the ITU will see its regulatory jurisdiction expand to become the agency primarily responsible for space debris management and mitigation throughout earth orbital space as liberal theorists would be inclined, if not to predict, then to advocate. Succinctly put, will the ITU's mandate for GEO management be extended to include rules for retiring satellites in all orbits to safe altitudes?

On the realist side, skepticism about the ITU's relevance and capacity to address issues of high state security interest points to the European Union's (EU) proposed *Code of Conduct for Outer Space Activities* (hereafter "Code of Conduct") as the more likely outcome.[8] Space debris is only one of a growing list of physical and electromagnetic threats to the hundreds of operating satellites whose missions depend upon telecommunications networks that are themselves often targets of ever-growing number of cyber-attacks. This paper is part of a

5 Oliver E. Williamson. (1996) *Mechanisms of Governance*. Oxford: Oxford University Press.

6 Milton Mueller. (2010) *Networks and States: The Global Politics of Internet Governance*. Cambridge: MIT Press. p. 8. The P-A problem is also addressed by Nobel Laureate Elinor Ostrom in her book, *Governing the Commons: The Evolution of Institutions for Collective Action*. (1990) Cambridge University Press.

7 *Ibid*.

8 Michael Krepon. "Waiting for the Space Code of Conduct." *SpaceNews*, September 12, 2011, p. 19.

larger research project examining how space debris and cyber-conflict converge as factors defining cyberwar in outer space (i.e., both physical and electromagnetic attacks against space systems). As part of this project's larger investigation about how cyberwar is militarizing the outer space region,[9] this paper will delimit its focus to an outline of the factors shaping the ITU's evolving role in an increasingly cyber-conflicted international system within the theoretical perspective of principal-agent theory. Does the ITU matter? We'll see.

**At Issue: Space Debris**

Space debris is a problem that literally feeds itself. On January 22, 2013, the Russian "BLITS" satellite apparently collided with a remnant piece of a Chinese weather satellite deliberately destroyed in a 2007 anti-satellite test.[10] Uncontrollable pieces of space junk collide creating even more space junk, now counted in the tens of thousands of detectable objects (generally larger than a few millimeters); the even smaller undetectable objects number probably in the millions or higher.[11] Following China's anti-satellite test in 2007[12] and subsequent incidents (such as the Iridium collision),[13] international debate over space debris and the danger it poses to long-term usability of certain orbital regions has steadily increased in tenor and fervor.[14] The space debris debate poses a myriad of technical and legal questions revolving around proposals seeking either realist, i.e., non-institutional means for mitigation and self-regulation (i.e., the EU *Code of Conduct for Outer Space Activities*),[15] or a liberal institutionalist response that would propose expanding the ITU's current regulatory responsibilities for

9 See, Theresa Hitchens. (2007). Debris, traffic management, and weaponization: Opportunities for and challenges to cooperation in space. *The Brown Journal of World Affairs* 14, (1): 173-186, <http://search.proquest.com/docview/219571735?accountid=10351> (accessed January 11, 2013).

10 Mike Wall and Leonard David. (2013) "Legal Action Against China Unlikely in Orbital Debris Collision," *Space News*, March 18, 2013, p. 20.

11 See, Nicholas L. Johnson. (2012) "Cleaning Up Space." *Harvard International Review* 33, no. 4: 67-71. *Military & Government Collection*, EBSCO*host* (accessed January 11, 2013).

12 Andrea Shalal-Esa, "China's space activities raising U.S. satellite security concerns," *Reuters*. (Source: <http://news.yahoo.com/chinas-space-activities-raising-u-satellite-security-concerns-061300435.html>, accessed January 14, 2013).

13 See, Wikipedia, "2009 Satellite Collision," <http://en.wikipedia.org/wiki/2009_satellite_collision> (accessed January 10, 2013).

14 Warren Ferster, "Pentagon: Russian Satellite Was not Hit by Chinese Orbital Debris," Space News, March 22, 2013. (Source: <www.spacenews.com/pentagon-russian-satellite-was-not-hit-by-chinese-orbital-debris?utm_source=WhatCountsEmail&utm_medium=Space%20News%20This%20Week&utm_campaign=2013%20SNTW&_wcsid=8697D5CF895A74E7C27898CFD57FB6575D5FA23D882C24CBA02ED664289C3102>, accessed March 22, 2013).

15 See, European Union. "Code of Conduct for Space Activities." (Source: <http://ec.europa.eu/enterprise/policies/space/esp/security/code/index_en.htm>, accessed on April 1, 2013).

space debris in the geostationary orbital region. It is beyond the scope of this brief overview to comprehensively analyze the space debris policy history to this date, but I would refer readers to Nicholas Johnson's excellent article outlining the policy history from the IADC/COPUOS guidelines to the 2007 UN General Assembly resolution pertaining to space debris.[16] To a growing extent, the balance of the debate appears to slope toward the realist side, as the growing prominence of cyberwar (or "cyber-conflict"[17]) undermines liberal institutionalist efforts to rely on multilateral mechanisms requiring significant data sharing about satellite systems.[18] In short, the international community stands before a crucial technological and regulatory tipping point, where *space debris weaponization* could create an expanded a cyberwar battlefield in outer space. Where such high stakes of national security exist, the theoretical research question posed above becomes all the more salient as a theoretical litmus test; i.e., "does the ITU matter?" This paper examines the dynamic interplay between space debris and cyberwar as factors reverberating throughout the evolutionary process that is re-shaping the ITU as the UN agency most directly charged with outer space and cyberspace regulation.[19]

This paper's analysis will proceed through the following steps. As a first step, the paper will briefly review the legal basis for the ITU's regulatory role for orbital and frequency spectrum management as a major component of the outer space governance regime. As a second step, the paper will focus on the aspects of space debris relevant to the discussion of the ITU's evolving role and the potential threat posed to space telecommunications. In the third and final step, the paper will examine the realist-liberal dimensions of the principal-agent debate about the future role of the ITU as space debris regulator.

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16 Nicholas L. Johnson. (2012) "Cleaning Up Space." *Harvard International Review* 33, no. 4: 67-71. *Military & Government Collection*, EBSCO*host* (accessed January 11, 2013).

17 The terms are evolving. In a legalistic view, "cyber*war*" denotes the use of cyber-weapons between states; "cyber*conflict*" would refer to the same between states and non-state entities. Although postulated for the future, a "strategic" use of cyber-weapons capable of currently inflicting such widespread destruction of an opponent's military and societal infrastructures so as to force the surrender or defeat of that opponent is probably not yet possible.

18 This is a significant sticking point between the Space Data Association and the U.S. Air Force's database cataloging satellite systems.

19 Of course, there are numerous other IGOs and NGOs participating in the space debris policy process, most prominent is the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and the UN's Office of Outer Space Affairs (OOSA). Among the NGOs, the Inter-Agency Space Debris Coordination Committee (IADC), whose members include NASA, ESA, Japan, and the Russian Space Agency (RKA); in addition, the Space Data Association represents a private sector approach to space traffic management.

### Step 1: A Cursory Look at the Legal Basis for the ITU Role as Regulator of the Geostationary Orbit and Radio Spectrum Resources

The ITU can trace its organizational origins back to the 1865 treaty establishing the International Telegraph Union, making the ITU the oldest continuously operating IGO.[20] Its regulatory purview has steadily expanded as its membership of state parties (or their authorized operating entities) approved periodic changes to its constituting charter (the "Constitution of the ITU," and "Convention of the ITU,") in response to new technological and marketplace innovations in telecommunications technologies and services.[21] Beginning with wire-based telegraphy regulation in the 19th Century, the ITU's jurisdiction expanded in the 20th Century to include the promulgation of radio regulations governing international deployments of wireless technologies and services involving ITU management of radio spectrum allocations. Principal-agent theory would explain the ITU's longevity by referring to the basic law of radio spectrum physics: no nation controls it (i.e., collective goods "externalities"). Owing to that immutable fact, states doing a cost-benefit calculation for task delegation almost always see an ITU benefit for spectrum management.[22]
Since 1947, the ITU has operated as a specialized UN agency. In 1963, the first Radio Regulations specifically addressing space-based telecommunications links were approved by an Extraordinary Administrative Radio Conference, thereby extending the ITU's regulatory reach into outer space.[23] This created a binding legal basis for an ITU outer space jurisdiction that precedes the entry into force of the 1967 *Outer Space Treaty* establishing the specific UN legal authorization to regulate aspects of outer space activities.[24] Subsequent UN treaties addressing issues related to space object registration, supervision, rescue, and liability for states' activities in the outer space environment entered into force during the 1970s.[25] Owing to the extensive literature covering the politics and policy evolution of the ITU's role as manager of the increasingly crowded

20 See, <www.itu.int/en/history/Pages/ITUsHistory.aspx> (accessed on January 9, 2013).
21 International Telecommunication Union. "Collection of the Basic Texts of the International Telecommunication Union adopted by the Plenipotentiary Conference 2011." Source: <www.itu.int/pub/S-CONF-PLEN-2011/en> (accessed on January 10, 2013).
22 Using public choice theory and transaction cost economics, the radio spectrum exhibits non-excludable externalities in the form of radio interference which compels collaborative coordination procedures establishing use rights. See, Oliver Williamson. (1996) *The Mechanisms of Governance*. Oxford: Oxford University Press.
23 Extraordinary Administrative Radio Conference to allocate frequency bands for space radiocommunication purposes - Space Radiocommunication Conference (Geneva, 1963) Source: <www.itu.int/en/history/Pages/CompleteListOfRadioConferences.aspx> (Accessed December 13, 2012).
24 See, <http://untreaty.un.org/cod/avl/ha/tos/tos.html> (accessed January 9, 2013).
25 A list of the treaties can be found at <http://untreaty.un.org/cod/avl/ha/tos/tos.html> (accessed January 9, 2013).

geostationary orbit from the 1970s to the present, this paper will focus on outlining the framework for the space debris debate.[26]

**ITU As Geostationary Orbit Manager**

Subsequent ITU radio conferences in 1983, 1985, and 1987, addressed issues about effective management of the geostationary orbit region as juxtaposed against developing states' claims for equitable allocations of orbital slots by the ITU for their future satellite systems. The ITU's chief management and enforcement tool is the process required by the Radio Regulations for registration of a satellite and its radio spectrum channels. Registration achieves a degree of international legitimation and legal protection of any country's proposed or actual use of a satellite system. Upon completion of the registration process, the relevant radio spectrum and geostationary location data for that satellite system are duly entered into the *Master International Frequency Register* (MIFR).[27] However, the ITU's long-standing "first-come, first-served" policy for registering proposed satellite systems was heavily criticized by developing countries who found many regions of the geostationary arc already reserved by earlier applicants from highly developed countries. In some cases, entities could exploit the ITU's procedures to propose "paper satellites" whose claim to a geostationary slot and radio spectrum could greatly complicate those applicants coming later.[28] A compromise was eventually reached that sought to balance the sovereign rights of states to engage in peaceful space activities guaranteed by the *Outer Space Treaty* with the dictates of effective orbital management. Throughout this process, the ITU membership has been largely unable to approved changes in the registration rules and especially in supporting enforcement of those rules requiring the actual placement of an operating satellite system into a geostationary orbital slot so as to filter out "paper satellites" from the ITU's overloaded registration procedure.[29]

Initially, the entities operating satellite networks were almost exclusively states, meaning that a close correspondence existed between the ITU's membership and the roster of space-faring countries during the 1960s-1980s. By the 1990s, a wide diversity of private, civilian, and military multinational entities were launching and operating space systems, further complicating the ITU's orbital

26 Please refer to the bibliography in, Larry F. Martinez, *Communications Satellites: Power Politics in Space*. Dedham: Artech House, 1985. A more recent treatment of this topic can be found in, Rob Frieden, Balancing Equity and Efficiency Issues in the Management of Shared Global Radiocommunication Resources. *University of Pennsylvania Journal of International Economic Law*. (2003) 24: 289-959.

27 See, <www.itu.int/ITU-R/go/space/en> (accessed January 9, 2013).

28 See, Frieden, p. 307.

29 In 1997, Resolution 80 of the Radio Regulations was intended to address this problem; it was addressed again in light of the Iranian actions at the 2012 WRC. See, Gerry Oberst, "WRC-12 Satellite Issues," *Satellite Today*. (Source: <www.satellite-today.com/via/globalreg/WRC-12-Satellite-Issues_38338.html>, accessed on April 1, 2013).

management policies and procedures.[30] In 2011, the ITU's largely consensual process of orbital registrations broke down as Iran attempted to qualify its claim to a pre-registered geostationary slot by temporarily leasing transponders on Intelsat and Eutelsat satellites to host its Zohreh-2 system.[31] Iran's actions in effect were a call on the Emperor's clothes or lack thereof in the ITU's legal regime. Iran's representative to the ITU then proposed new regulations to the 2012 ITU World Radiocommunication Conference (WRC) that convened from January 23 to February 17, 2012 in Geneva.[32] All the while, Iran's ongoing attempts to jam BBC and other satellite broadcasts from Iranian receivers prompted the 2012 WRC to promulgate amendments to the Radio Regulations specifying state obligations to cease jamming or to take "necessary action" to compel entities within their jurisdiction to cease the jamming of satellite signals.[33]Cyberconflict has now part of the ITU's international law.

### Step 2: The ITU Regulatory Role with Respect to Space Debris

Succinctly put, a dead drifting satellite behaves like space debris because that's what it is. As an uncontrollable space object, satellites at the end of their engineering ("stationkeeping") lifetimes are a source of concern for the collision threat or radio interference they pose to operating satellites in the geostationary arc. As the "Zombie" satellite episode illustrated in 2010, skillful monitoring and maneuvering can ensure that drifting and operating satellites do not interfere with each other.[34] While operating satellites can be maneuvered to avoid collisions with drifting intact satellites, the greater threat is from smaller pieces of space junk that are generated by exploding fuel tanks and batteries, and collisions with other uncontrollable pieces of drifting space junk.

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30 See, *Project 2001 Report*. Cologne: University of Cologne, 2001.

31 Peter B. de Selding. "ITU Board Fails to Resolve Dispute over Iranian Service." *SpaceNews*, November 7, 2011, p. 4.

32 Peter B. de Selding. "Iran's WRC-12 Delegation Pushes for Overhaul of Satellite Registry Rules," *Space News*, January 27, 2012. (Source: <www.spacenews.com/article/irans-wrc-12-delegation-pushes-overhaul-satellite-registry-rules?utm_source=WhatCountsEmail&utm_medium=SPACE%20NEWS%20EARLY%20BIRD%20NEW&utm_campaign=Early%20Bird%20Newsletter#.UVn_M6t36dM>, accessed on April 1, 2013).

33 "UN Telecommunications Body Requires Iran to Cease Satellite Jamming." (Source: <www.iranhumanrights.org/2012/02/wrc-12/>, accessed on April 1, 2013).

34 The INTELSAT Galaxy 15 satellite suffered a complete telemetry system failure that made the still broadcasting satellite completely unresponsive to control commands from the ground. After months of delicate maneuvers around operating satellites, the Galaxy 15's batteries failed, forcing the computer to reset, thus re-booting the command system. Denise Chow, "'Zombie' Satellite Comes Back to Life," *SPACE.com*, 29 December 2010. (Source: <www.space.com/9677-galaxy15-zombie-satellite-life.html>, accessed on April 1, 2013).

To lessen this collision danger, the ITU in 1993 promulgated regulations requiring entities operating satellites in the geostationary orbit to move those spacecraft nearing the end of their engineering lifetimes into a higher parking orbit where they, as drifting "dead" space objects, would not pose a collision threat to operating satellites.[35] In this way, the ITU became one of the first IGOs to develop regulatory definitions and rules governing space debris. However, as the quote below indicates, the ITU's lack of hard enforcement mechanisms leaves much to be desired in terms of actual behavioral changes.

Nancy Gallagher, assistant director of the Center for International and Security Studies at the University of Maryland, says it's "infinitely more sensible to stop creating debris in the first place." Only 11 of 21 spacecraft in geostationary orbit that stopped functioning in 2009, she says, were disposed of properly — meaning they were either sent into the lower atmosphere to burn up or put into out-of-the-way "parking orbits."[36]

### Step 3: The Legal-Political Dynamics of the Principal-Agent Debate about the Relevancy of the ITU as Space Debris Regulator

To be succinct, are countries likely to delegate space debris mitigation and management to the ITU, or will they favor a less-institutional approach along the lines of the proposed EU *Code of Conduct for Outer Space Activities*?

#### EU Code of Conduct

The EU Code of Conduct was originally drafted and released for signature in 2008, and re-released by the Council of the European Union as a revised draft on September 27, 2010. The proposed "Code of Conduct for Outer Space Activities"[37] would seek to ensure that signatory states in the conduct of their space activities would minimize the potential for space debris creation by the following "General Measures":

> II. General Measures
>
> 4. Measures on space operations
>
> 4.1. The Subscribing States are committed to establishing and implementing their policies and procedures to minimise the possibility of accidents in space, collisions

35 Nicholas L. Johnson. (1999) Protecting the GEO Environment: Policies and Practices. *Space Policy*. 15, no. 3: 127-135.

36 See, Konstantin Kakaes. "Space Junk Poses Risk," <http://library.cqpress.com/globalresearcher/document.php?id=cqrglobal2011081600&PHPSESSID=40cgn1or80qpb4lu0aba4rd8t5> (accessed January 10, 2013).

37 Council of the European Union, "Code of Conduct for Outer Space Activities," Document 14455/10, October 10, 2010.

between space objects or any form of harmful interference with other States' right to the peaceful exploration and use of outer space.

4.2. The Subscribing States, commit in conducting outer space activities, to:

- refrain from any action which intends to bring about, directly or indirectly, damage, or destruction, of outer space objects unless such action is conducted to reduce the creation of outer space debris and/or is justified by the inherent right of individual or collective self-defence in accordance with the United Nations Charter or imperative safety considerations;

- take appropriate measures to minimize the risk of collision; and
- abide by and implement all International Telecommunications Union recommendations and regulations on allocation of radio spectra and orbital assignments.

4.3. When executing manoeuvres of space objects in outer space, for example to supply space stations, repair space objects, mitigate debris, or reposition space objects, the Subscribing States confirm their intention to take all reasonable measures to minimise the risks of collision.

4.4. The Subscribing States resolve to promote the development of guidelines for space operations within the appropriate fora for the purpose of protecting the safety of space operations and the long-term sustainability of outer space activities.

4.5. The Subscribing States resolve to promote further security guarantees within the appropriate fora for the purposes of enhancing the security of outer space activities by all States and the prevention of an arms race in outer space.

5. Measures on space debris control and mitigation

In order to limit the creation of space debris and reduce its impact in outer space, the Subscribing States commit to:
- refrain from the intentional destruction of any on-orbit space object or other activities which may generate long-lived space debris;
- adopt and implement, in accordance with their own internal processes, the appropriate policies and procedures or other effective measures in order to implement the Space Debris Mitigation Guidelines of the United Nations Committee for the Peaceful Uses of Outer Space as endorsed by UNGA Resolution 62/217. [38]

Moreover, the proposed Code emphasizes in paragraph 1.4 that adherence to the code is "voluntary" and "open to all states."[39]
As Jeff Kueter, President of the George C. Marshall Institute, writes in a recent article:

38 *EU Code of Conduct for Outer Space Activities*, 2010.
39 *Ibid.*

> The desire for a Code of Conduct arises from frustration with the space arms control process and out of concern for the stability of the space security environment. Driven principally by European diplomats and U.S. think tanks, in particular the Stimson Center, proponents for a Code of Conduct argue that setting "rules of the road" at the executive level of participating states will prevent incidents and irresponsible actions… According to Stimson, a Code is designed "to prevent interference with another nation's space objects, the harmful use of lasers against space objects, and to prevent activities, experiments, or tests that result in the deliberate generation of persistent space debris. The Code also promotes information exchanges, consultation, and sound traffic management practices in space."
> …The U.S. Department of Defense goes further: "An international Code of Conduct can enhance U.S. national security. As more countries and companies field space capabilities, it is in our interest that they act responsibly and that the safety and sustainability of space is protected. A widely-subscribed Code can encourage responsible space behavior and single out those who act otherwise, while reducing risk of misunderstanding and misconduct. Debris mitigation standards, guidelines for reducing radio frequency interference, and shared space situational awareness can help protect space and the advantages we derive."[40]

On March 8, 2012, the *Secure World Foundation*[41] conducted a panel of experts symposium entitled, "International Code of Conduct for Outer Space Activities - The International Perspective." The report from the panel featured the following points:

> -- The draft Code can still be modified. An increasing number of States are participating in discussions and within the process.
>
> -- It is in everyone's best interest to evolve the Code, as no legally-binding treaty on space sustainability is in the offing for the near-term.
>
> -- There are important and newly emerging issues of "New Space" that involve the oceans, cyberspace, as well as outer space. International rulemaking must take into account matters of space security, space situational awareness, and well as re-entry of satellites. There is an international movement to establish rules of the road in space.
>
> -- For the Code to succeed, as many countries should participate as possible via a flexible forum, one that includes civil and military aspects of using outer space, and there should be clear implementation mechanisms.

40 Jeff Kueter, "Do We Need a Code of Conduct for Space? Considering Recent Developments in the Effort to Change Behavior in Space," published by the *George C. Marshall Institute*, February 12, 2012.

41 Source: <www.newswise.com/articles/view/586738?print-article> (Accessed on March 16, 2012).

> -- The Code should complement other initiatives instead of compete with them. In this regard, not all military activities in outer space are peaceful and there needs to be a definition for what constitutes a military activity.
>
> -- There needs to be consistency and cooperation, not competition between initiatives that are shaping the Code. In doing so, an established lexicon would be useful so that all participating speak "the same language." Constant and open dialogue and the free exchange of information are essential elements in the internationalization of the Code.
>
> Step in the right direction
>
> "I believe our round table on the International Code of Conduct for Outer Space activities was the first one of its kind where representatives of several states assembled to publicly discuss the code," Lukaszczyk said.
>
> "We at SWF are very pleased that we could facilitate this very important conversation," she said. Lukaszczyk said that there are pros and cons regarding the Code, "but regardless of what one might think, it is currently the most feasible option on the table - a step in the right direction."
>
> "It is important that the EU continues to internationalize this code, Lukaszczyk said, so that the process is smooth and transparent. "In large measure, it is not the content of this Code that has been problematic," she said, "it has been the process that has been questioned. By way of international cooperation and open discussion on the Code, a satisfactory outcome could be expected."42

On March 9, 2012, former U.S. Ambassador to the United Nations John R. Bolton and University of California, Berkeley Law School Professor and former George W. Bush Administration State Department legal adviser John C. Yoo wrote an editorial in the *New York Times* in which they assailed the EU Code of Conduct as an effort that

> …would substantially impede advances in space technology because such innovations could also be labeled as military. While security activities receive an exception, it appears confined to self-defense, a term often defined narrowly to include only cross-border attacks. We should not take the unnecessary risk that our rivals will exploit such ambiguity to prevent legitimate American actions.[43]

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42 Remarks and panel summary by Agnieszka Lukaszczyk, European Program Manager, Secure World Foundation. Source: <www.newswise.com/articles/experts-confer-on-rules-of-the-road-for-outer-space-activities> (Accessed on March 16, 2012).

43 John R. Bolton and John C. Yoo, "Hands Off the Heavens," *New York Times*, March 9, 2012, p. A-21.

While realists would remain skeptical about the likelihood of the ITU gaining a significant new delegation of authority to manage space debris, would the continuing impasse over an international agreement establishing a "voluntary" framework *Code of Conduct* for space debris require the ITU to assume, by regulatory default, some of the management functions envisioned by the *Code of Conduct*?

Clearly, the voluntary nature of the space debris guidelines have not (yet) resulted in behavioral changes among states supervising satellite operators, especially egregious with respect to the fact that less than one-third of retired GEO satellites are being boosted into graveyard orbits as per ITU guidelines.[44] Does this mean that the ITU's regulatory reach is doomed to policy irrelevancy? Not quite.

The key element behind the ITU's longevity as we've seen is the non-excludable nature of radio spectrum interference. This requires consensual agreement and collaboration among users to avoid a "unit veto" death spiral into radio interference "state of nature" chaos where everyone loses. In the way, the ITU's international legal authority to manage the radio spectrum for space activities and systems translates into the spillover effect that P-A theory would predict for ancillary issues such as GEO orbit management (i.e., requiring boosts into graveyard orbits). The empirical test will be to measure compliance with the GEO guidelines. Or even more telling will be whether such practices are written into "hard law" ITU constitutive documents.

**What Would a Future Space Debris Regime Look Like?**

A strong clue can be found from the recently concluded ITU World Conference on International Telecommunications (WCIT) tasked with approving revisions to the International Telecommunications Regulations (ITRs).[45] Here again, the P-A debate over delegation took place within the context of whether states should "claw back" significant aspects of Internet control and regulation (the realist view), or whether the current "multi-stakeholder" model of mixed governance between governmental (e.g., ITU) and non-governmental (e.g., Internet Corporation for Assigned Names and Numbers – ICANN), would prevail (the liberal view). To a large degree, efforts to compel delegation of Internet governance to greater inter-governmental control were deleted from the final document, as it failed to garner the required votes during the conference's concluding hours due to the growing degree of cyber-conflict in international telecommunications, a paradox since the realist "claw back" would normally be expected to prevail when high strategic interests are at stake. Instead, a Goldilocks "not too hot, not too cold" regime would appear to be the emerging form of governance. *Ad hoc* arrangements that do not require disclosure of sensitive or proprietary information offer states intrinsic advantages over hard

44 Hitchens, *op cit*.

45 International Telecommunication Union, "WCIT-12: Background Briefs and FAQs," (Source: <www.itu.int/en/wcit-12/Pages/WCIT-backgroundbriefs.aspx>, accessed March 22, 2013).

international law or tighter forms of IO regulation. The WCIT result would appear to reveal the relevant factors that will ensure a mixed "multi-stakeholder" space debris regime.

## Concluding Observations

P-A Theory provides insights about the likelihood of additional space debris jurisdiction being delegated to the ITU. Heavy transaction costs combined with non-excludable externalities of radio spectrum interference work in favor of an enlarged ITU role. Since 1865, the ITU has seen its jurisdictions expand to encompass innovative and dynamically evolving telecommunications and computer data services both on earth and in outer space. Since all space satellites use radio spectrum, the ITU has long exercised an administrative jurisdiction over space objects and systems. Its geostationary management functions already include elements of space debris regulation. The path of least resistance for an effective and universal space debris regime would appear to lead to the consensus-built ITU. However, in the first decade of the 21st Century, that consensus began to break down as exemplified by the Iranian dispute. What changed?

This paper argues that cyberconflict (or "cyberwar") is prompting states to recalibrate their P-A delegation calculations that previously worked so strongly in favor of the ITU. Cyberconflict goes hand-in-hand with the growing awareness among states that their military establishments and societal infrastructures are increasingly dependent upon information and telecommunications systems that are space-based, as demonstrated most clearly by the growing number of states deploying navigation and military satellite communication systems. Space is being cyber-militarized. To the extent that ITU satellite management functions require information sharing, states perceive mounting disincentives for additional jurisdictional delegations to the ITU. Hence we see the entirely "voluntary" nature of the EU *Code*, especially in regards to information sharing. Perhaps even more importantly, real-time space debris avoidance capabilities pose even greater sovereignty-security costs. The scanning resolutions required for effective on-orbit avoidance warnings potentially exposes the capabilities of highly secretive military systems. In this way, cyberconflict poses high delegation costs to any expanded ITU space debris jurisdictional authority.

### Space Debris: Asymmetrical Cyberwarfare?

While cyberconflict is normally thought of predominately in "cyber" terms, i.e., software or electromagnetic threat factors, space debris compels an expanded perspective. The Rumsfeldian "unknown unknown" here is the degree to which countries may perceive space debris as the "poor man's outer space weapon of mass disruption." The worldwide concern over the DPRK's satellite launch in December 2012 was, perhaps, only partly due to concerns about nuclear weapon delivery capability, and, to a growing degree, much more understandable due to the realization that the DPRK now possessed a potential space debris weapon that could disrupt strategic assets of the major space powers.

Hypothetically, even a technologically limited space power such as the DPRK could pose a vulnerability threat to the multiplying deployments of navigations satellites by launching a debris cloud into the systems' orbital altitudes.[46]
And finally, does the ITU matter? Yes, it does. But whether the ITU will matter in the future for purposes of effective space debris management, mitigation (prevention of space debris), and perhaps even remediation (i.e., removal of space debris), will increasingly pivot on whether states will delegate those tasks to an international agency – a prediction that can be explored through insights proffered by P-A theory. While liberal institutionalists will point to the perceived utility of the ITU to minimize high transaction costs-externalities associated with space radio spectrum management with spillover benefits for space debris management, the realists will focus on heavy security burdens accompanying any effective space debris avoidance capability. On both sides of the P-A delegation question, cyberconflict will play an increasingly determinative role. As states perceive their growing vulnerability to cyberconflict, initially enthusiastic realist impulses toward the voluntary EU *Code of Conduct* have eroded as institutionalist calculations bend in the ITU's favor. Ultimately, as space debris and its potential weaponization becomes increasingly merged with cyberconflict near the top of the global agenda, P-A theory's cost-benefit insights will contribute to the development of international relations theory for asymmetrical power projection - already a major focus for 21st Century world politics.

## List of References

Anselmo, L, and Pardini, C. (2008) Space Debris Mitigation in Geosynchronous Orbit. *Advances in Space Research*. 41, no. 7: 1091-1099.

Breitmeier, H., Young, O., and Zürn, M. (2006) *Analyzing International Environmental Regimes from Case Study to Database*. MIT Press.

Brenner, S. (2009) *Cyberthreats: The Emerging Fault Lines of the Nation State*. Oxford University Press.

Contant, Corinne, Petr Lala, and Kai-Uwe Schrogl. (2007) Status of the IAA Study Group on Traffic Management Rules for Space Operations. *Acta Astronautica*. 61, no. 7: 644-647.

46 See, Wikipedia, "Global Positioning System," (Source: <http://en.wikipedia.org/wiki/Global_Positioning_System>, accessed April 1, 2013). Weaponization of space debris is discussed in the Neuneck and Rothkirch study of "Space Weaponization and Preventive Arms Control" in Neuneck, Goetz, and Rothkirch, Andre. (2005) "Weltraumbewaffnung und praeventive Ruestungskontrolle," Working Paper #10, Interdisziplinaere Forschungsgruppe Abruestung und Ruestungskontrolle (IFAR). Source: <www.ifsh.de/IFAR/pdf/wp10.pdf> (accessed January 14, 2013).

Evans, Elizabeth H, and Scott T Arakawa. (2012) Time for a Solution to the Orbital Debris Problem. *The Air and Space Lawyer*. 24, no. 3: 9.

Frieden, Rob. (2003) Balancing Equity and Efficiency Issues in the Management of Shared Global Radiocommunication Resources. *University of Pennsylvania Journal of International Economic Law*. 24: 289-959.

Gaycken, S. (2012) *Cyberwar: Das Wettrüsten hat längst begonnen*. Muenchen: Goldman Verlag.

Hitchens, Theresa. (2007) Debris, traffic management, and weaponization: Opportunities for and challenges to cooperation in space. *The Brown Journal of World Affairs* 14, (1): 173-186, <http://search.proquest.com/docview/219571735?accountid=10351> (accessed January 11, 2013).

Johnson, Nicholas L. (1999) Protecting the GEO Environment: Policies and Practices. *Space Policy*. 15, no. 3: 127-135.

Johnson, Nicholas L. (2012) "Cleaning Up Space." *Harvard International Review* 33, no. 4: 67-71. *Military & Government Collection*, EBSCO*host* (accessed January 11, 2013).

National Research Council, Committee for the Assessment of NASA's Orbital Debris Programs. (2011) *Limiting Future Collision Risk to Spacecraft: An Assessment of NASA's Meteoroid and Orbital Debris Programs*.
Washington, DC: National Academies Press.

Neuneck, Goetz, and Rothkirch, Andre. (2005) "Weltraumbewaffnung und praeventive Ruestungskontrolle," Working Paper #10, Interdisziplinaere Forschungsgruppe Abruestung und Ruestungskontrolle (IFAR). Source: <www.ifsh.de/IFAR/pdf/wp10.pdf> (accessed January 14, 2013).