The Current and Future Efforts for Reaching Long-Term Sustainability of Outer Space: Is It the Time to Develop Legally Binding Rules Related to Space Debris?

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Abstract

Man-made space debris has become one of the most discussed issues concerning the further development of outer space activities. The accumulation of such space debris in low Earth (LEO) and geostationary orbit (GEO) orbits has been caused by a number of factors. As a result, the world space community has realized that this problem features such a serious risk that can probably make the space exploration unfeasible for generations. A number of recent non-legally binding rules proposals for a new international agreement on space stability are presently on the table. The United Nations Space Debris Mitigation Guidelines endorsed by General Assembly and its resolution 62/217 represent the current efforts to be implemented in national policies. Likewise, the proposals for the creation of a Space Traffic Management and of an International Space Situational Awareness, as well as techniques to remove debris and the Role of Transparency and Confidence-Building Measures have been achieved for long-term sustainability of the outer space. On the other hand, even though spacefaring nations have reached no consensus to consider Czech Republic's proposal during the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) sessions, the Subcommittee during its fifty-first session approved a new agenda item to start the legal analysis of binding rules for sustainable activities in outer space. This paper makes recommendations for considering substantive legal problems of space debris and legal analysis of the UN Space Debris Mitigations Guidelines in the UN COPUOS Legal Subcommittee.

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1 Introduction

Between the launch of Sputnik in 1957 and the end of 2011 there were 4.841 launches, with 80 launches in 2011. There are currently close to 1300 operational satellites.[1] Most of these objects are concentrated in areas of space that provide the greatest utility and benefit to humankind, particularly in Low-Earth (LEO) between 600 and 1,500 kilometers, where many Earth observation satellites are located, as well as in Geostationary Earth Orbit (GEO) at 36,000 km, where most of the telecommunications satellites are placed.[2]

At present, 10 nations have the capability for space launch, and more than 55 nations and regional governmental organizations operate satellites in Earth orbit. The result is a growing amount of space debris, which has been identified as the major threat for reaching long-term sustainability of outer space activities. The amount of space debris in LEO and GEO orbits has changed the space environment. As a result, the space community has been discussing appropriate measures that should be taken to ensure a sustainable space environment.

Technical, legal and policy changes must be made in order to reach long-term sustainability of outer space activities. Mitigation practices measures have already been taken to minimize space debris risks. These measures are currently being conducted both at national and international levels. On the other hand, remediation measures and the developing of legally-binding rules have faced a big challenge to effectively reaching long-term sustainability of outer space activities.

This paper will provide an overview the current and prospective efforts to minimize and remediate space debris issue and the developing legally-binding rules for this situation, in order for reaching long-term sustainability of outer space activities. Moreover, it will provide an overview of the following: long-term sustainability of outer space activities, space debris situation, current efforts (The UN COPUOS Scientific and Technical Subcommittee Working Group on Long-Term Sustainability of Outer Space Activities, the United Nations Space Debris Mitigation Guidelines, Transparency and Confidence-Building measures) and prospective efforts (Space Situational Awareness, Space Traffic Management, Debris Removal). Finally, it will offer a description of the currently developing, legally-binding rules in the Czech Republic's proposal, as well as the approval of the new agenda item of the UN COPUOS Legal Subcommittee.

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1 Gérard Brachet, *The Long Road to a Sustainable Use of Outer Space*, lecture event organized by the Netherlands Space Society at the Leiden University, Sept 2012.

2 UN doc. A/AC.105/C.1/2011/CR. 14, *Towards Long-Term Sustainability of Space Activities: Overcoming the Challenges of Space Debris,* A Report of the International Interdisciplinary Congress on Space Debris, January 2011, at 17. [hereinafter Report of the International Interdisciplinary Congress on Space Debris]. Available at <www.unoosa.org/pdf/limited/AC105_C1_2011_CRP14E.pdf>.

2 Long-Term Sustainabilty of Outer Space Activities

The term sustainable and sustainability are used to describe many different approaches toward improving our way of life. Sustainability does not have a rigid definition; however, in general it is the long-term maintenance of responsibility, which has environmental, economic, and social dimensions, and encompasses the concept of stewardship. In short, it is the responsible management of resources. For outer space or space activities, the term long-term sustainability of outer space, or space sustainability, encompasses the responsible management of its environment.

Ray A. Williamson, senior advisor of Secure World Foundation, defines "a sustainable outer space environment is one in which all humanity can continue to use outer space for peaceful purposes and socioeconomic benefit over the long term."[3] He adds that "in common with sustainable practices on Earth, space sustainability will have to be attained by responsible planning and management of space resources and maintained through a balancing of economic costs and societal benefits within the physical constraints imposed by operating in Earth orbit.[4]

The issue of sustainability of space activities has already been addressed by many sectors of the space community, such as: i) the Inter-Agency Space Debris Coordination Committee (IADC) which focused on the proliferation of space debris; ii) the International Academy of Astronautics which published a report on space traffic management in 2006; and iii) the International Association for the Advancement of Space Safety (IAASS), which published a report called "An ICAO for Space?" in 2007.

At the international level, the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) is discussing (in its Scientific and Technical Subcommittee) the "Long-Term Sustainability of Space Activities which will be addressed further".

3 Space Debris

The Inter-Agency Space Debris Coordination Committee Space Debris Mitigation Guidelines (IADC Space Debris Mitigation Guidelines)[5] were developed by an international forum of governmental bodies for the coordination of activities related to space debris. The Space Debris Mitigation Guidelines of the

3 Ray A. Williamson, *Assuring the Sustainability of Space Activities*, IAC-11.E3.4.1, 62st International Astronautical Congress, Cape Town, South Africa, 2011. Available at <http://swfound.org/media/51170/raywilliamson-iac-e.3.4.1.pdf>.

4 *Id.,* at 4.

5 UN doc. A/AC/105/C.1/L.260, Inter-Agency Space Debris Coordination Committee Space Debris Mitigation Guidelines [hereinafter IADC Space Debris Mitigation Guidelines], at 6. Available at <www.unoosa.org/pdf/limited/c1/AC105_C1_L260E.pdf>.

Committee on the Peaceful Uses of Outer Space (UN COPUOS Space Debris Mitigation Guidelines),[6] defined space debris as "all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional."[7]
According to the Report of the International Interdisciplinary Congress on Space Debris, the primary sources of space debris are:

> "i) satellites which have reached their end-of-life and been left in orbit; ii) upper stages of launchers which had been used to place satellites in orbit; iii) operational debris, which are objects intentionally released during a mission (these include casings need to protect instruments during the launch phase, mounting systems for solar panels or antennas before their deployment in orbit, and release mechanisms); iv) the result of fragmentation, either by a collision between two objects in orbit or from a space object accidentally or intentionally exploding; v) propellant residues from solid propellant motors that are used to carry out orbit transfers, particularly between a transfer orbit and geostationary orbit, which release small aluminum particles during and immediately following thrust; and vi) ageing of materials in space due to the extremely hostile environment that leads to production of large quantities of debris (e.g. heat shield covers flaking, paintwork peeling off, etc.). In addition, collisions between large objects (usually spacecraft or rocket bodies) and other pieces of space debris provide an additional source of fragmentation debris."[8]

At present, in orbit around the Earth are: 29,000 objects greater than 10 centimeters, 60,000 objects greater than 5 centimeters, 700,000 objects greater than 1 centimeter, 200 million objects greater than 1 millimeter.[9] These counts may increase in the future because of what is called the "Kessler syndrome": the collisional cascading process whereby large pieces of space debris get hit by smaller pieces, creating hundreds or thousands of new pieces of small debris, which can then collide with other large pieces."[10] All such pieces are detected and tracked by radars and telescopes.
The amount of space debris increased massively with the "destructive Anti-satellite weapons (ASAT) tests of the United States' Solwind ASAT test in 1985; the Chinese ASAT test in January 2007 and the USA-193 removal episode in

6 UN COPUOS Space Debris Mitigation Guidelines. Available at <www.unoosa.org/pdf/bst/COPUOS_SPACE_DEBRIS_MITIGATION_GUIDELINES.pdf>.
7 IADC Space Debris Mitigation Guidelines, at 6.
8 Report of the International Interdisciplinary Congress on Space Debris, at 12.
9 Carsten Wiedman and Perter Vorsmanns, *Space Debris – Current Situation*, Fifty-first session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, 2012. See <www.unoosa.org/pdf/pres/lsc2012/tech-02E.pdf>.
10 Brian C. Weeden, *Overview of the Legal and Policy Challenges of Orbital Debris Removal*, IAC-10.A6.4.4, 61st International Astronautical Congress, Prague, Czech Republic, 2010. See <http://swfound.org/media/17963/legal-policy-orbital-debris-iac-bw-2010.pdf>.

February 2008. The worst three events in terms of space debris generation are the 2007 Chinese ASAT test, the 2007 Russian Britz-M rocket break-up and the February 2009 satellite collision. These events are a serious threat to safe operations in space."[11]

4 Efforts for Reaching Long-Term Sustainability of Outer Space Activities

There are a variety of mechanisms that can be implemented to control space debris and ensure long-term sustainability of the use of space. Space debris can be addressed through mitigation and remediation. Mitigation "includes practices such as limiting the number of objects released during normal operations, reducing long-term presence of an object in orbit after end-of-life, and releasing of stored energy through passivation, and remediation which includes methodologies for removal of existing space debris, a topic that is that in its infancy and facing substantial technical, financial, political, and legal hurdles"[12]
Measures to prevent, mitigate, and/or remediate space debris can be categorized as short-term (0-5 yrs), medium-term (5-20 yrs), and long-term (20+ yrs).[13]
Efforts to achieve a solution for dealing with matters related space debris have been made. Technical initiatives, policy and legal measures have been discussed, proposed and approved, as will be detailed below.

4.1 Current Efforts

4.1.1 The UN COPUOS Scientific and Technical Subcommittee Working Group on Long-Term Sustainability of Outer Space Activities

The issue of long-term sustainability of outer space activities was introduced in June 2007, at the 50th session of the UN COPUOS. Gérard Brachet, then chair of that session, proposed: "the Committee should tackle the issue of long-term sustainability of outer space activities with a bottom-up approach similar to the development of the "UN Space Debris Mitigation Guidelines."[14] In 2008, the French delegation announced its plan to submit an official proposal to UN COPUOS to add a sustainability item to the agenda. After consensus, the UN COPUOS agreed to include this item as a new agenda item of its Scientific and Technical Subcommittee in 2010.[15] In the same year, an official working group formed four expert groups to discuss certain topics relevant to long-term

11 Agnieszka Lukaszczyk, Laurence Nardon, Ray Williamson, *Towards Greater Security in Outer Space – Some Recommentations*, Note de Institut Français des Relations Internationales (IFRI), 2009. <www.ifri.org/files/Espace/Note_Espace_Security.pdf>.
12 Michael J. Listner, *Legal Issues of Space Debris Remediation,* Space Safety magazine, Issue 5, 2012.
13 Report of the International Interdisciplinary Congress on Space Debris, at 38.
14 *Supra* note 1.
15 *Id.*

space sustainability. Each expert group addresses different aspects of the sustainability issue: 1) Expert Group A: Sustainable Space Utilization Supporting Sustainable Development on Earth; co-chaired by Portugal and Mexico; 2) Expert Group B: Space debris, Space Operations, and Tools to Support Space Situational Awareness; co-chaired by Italy and the United States; 3) Expert Group C: Space Weather; co-chaired by Japan and Canada; 4) Expert Group D: Regulatory Regimes and Guidance for Actors in the Space Arena; co-chaired by Australia and Italy.[16]
The UN COPUOS Scientific and Technical Subcommittee Working Group on Long-Term Sustainability of Outer Space Activities has the goal to examine and propose measures to ensure the safe and sustainable use of outer space for peaceful purposes and the benefit of all countries. Its goal is to produce a consensus report outlining voluntary best practices for all space actors.

4.1.2 United Nations Space Debris Mitigation Guidelines

The United Nations Committee on Peaceful Uses of Outer Space Debris Mitigation Guidelines (UN Space Debris Mitigation Guidelines)[17] are international measures and the first important step towards long-term sustainable use of outer space with the goal of limiting the generation of space debris in the environment. They are technical measures rather than legally-binding rules, which are applicable to mission planning and the design of spacecraft and orbit stages that will be sent into Earth orbit.[18]
The UN Space Debris Mitigation Guidelines began to be discussed in the Scientific and Technical Subcommittee of the UN COPUOS in 1994, were adopted by the Committee in 2007, and endorsed by the UN General Assembly in its resolution 62/217[19] in 2007. They were based on the IADC Debris Mitigation Guidelines.[20] The UN Space Debris Mitigation Guidelines contains seven general recommended guidelines to be implemented by States primarily through national legislation, regulations, and/or policy directives.[21] The UN Space Debris Mitigation Guidelines are: 1) Limit debris released during normal operations; 2) Minimize the potential for break-ups during operational phases;

16 An overview on Long-term sustainability of outer space activities, see UN doc. A/AC.105/C1/2010/CRP.3, available at <www.unoosa.org/pdf/limited/c1/AC105_C1_2010_CRP03E.pdf>. See also the Report of the International Interdisciplinary Congress on Space.
17 UN Space Debris Mitigation Guidelines, 2010. See <www.unoosa.org/pdf/bst/COPUOS_SPACE_DEBRIS_MITIGATION_GUIDELINES.pdf>.
18 Report of the International Interdisciplinary Congress on Space Debris, at 26. See also Ram Jakhu, *Towards Long-Term Sustainability of Space Activities: Overcoming the Challenges of Space Debris*, presentation available at: <www.oosa.unvienna.org/pdf/pres/stsc2011/tech-35.pdf>.
19 UN Doc. A/RES/62/217. Available at: <www.unoosa.org/pdf/gares/ARES_62_217E.pdf>.
20 *Supra* note 5.
21 Report of the International Interdisciplinary Congress on Space Debris, at 27.

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 orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission.
The guidelines simply provide guidance on how to conduct space activities principally in order to prevent, or at least to minimize, harmful by-products of space activities. They do not deal with the disposal of the debris currently orbiting in space (e.g. remediation), legal matters and insurance.
Even though they are voluntary measures, some member states have adopted domestic policies, legislations, and/or regulations that implement the UN Space Debris Mitigation Guidelines to commercial, civilian, and/or military space actors, for example: France (French Space Operations Act by CNES – 2009); United States (US National Policy – 2010); China (China's Space Activities Act in 2006 – white paper release). In additional to voluntary national measures, regional measures also have been done, e.g. the European Code of Conduct on Space Debris,[22] which is based on IADC Space Debris Mitigation Guidelines.

4.1.3 Transparency and Confidence-Building Measures (TCBMs)

Theresa Hitchens, Director of the United Nations Institute for Disarmament Research (UNIDIR), defines confidence-building measures "as a tried-and trusted method to dampen national threat perceptions and establish consensus about mutual interests among stakeholders."[23] They can involve, for example, consultative modalities seeking to facilitate dialogue between nations to reduce tensions and the risk of armed conflict by instituting preventive mechanisms, and measures allowing states to monitor each other's behavior as well as verify compliance.[24] It could be understood as using traditional tools of diplomacy and international relations. They have been employed for decades, and had a special role during the Cold War. They involved exchange of information on military force levels, troop maneuver and border management.

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22 The European Code of Conduct on Space Debris was approved in 2004 and has been adopted by ASI (Agenzia Spaziale Italiana), BNSC (British National Space Centre), CNES (Centre National d'Etudes Spatiales), DLR (Deutsches Zentrum für Luft und Raumfahrt) and ESA (European Space Agency). See <www.cnsa.gov.cn/n615708/n676979/n676983/n893604/appendix/2008529151013.pdf>.

23 Theresa Hitchens, *Confidence-Building Measures: Preventing the Great from Standing in the way of the Good*, in Building the Architecture for Sustainable Space Security-Conference Report, 30-31 March 2006, United Nations Institute for Disarmament Research (UNIDIR), 2006. See <www.unidir.org/pdf/articles/pdf-art2566.pdf>.

24 Jana Robinson, *The Role of Transparency and Confidence-Building Measures in Advancing Space Security,* ESPI Report 28, at 4, 2010. Available at: <www.espi.or.at/images/stories/dokumente/studies/ESPI_Report_28_online.pdf>.

TCBMs in space was adopted by the UN for the first time via UN Resolution 60/66 (Transparency and Confidence-Building Measures in Outer Space Activities".[25] Space TCBMs were likewise introduced in a 2006 Russian and Chinese working paper (CD/1778)[26] and led to the adoption of UN Resolution 62/43.[27] They are present in legally binding space agreements and related UN Resolutions. Examples of bilateral space TCBMs are those between United States and Russia (after the February 2009 satellite collision), and information exchanges between the United States and China on computer programming linked to debris.

5 Prospective Efforts

For the long term, technical and regulatory measures have been proposed to make space operations more safe and secure, as a result of the growth of orbital debris, which is detailed below.

5.1 Space Situational Awareness

Space situational awareness (SSA) "is broadly defined as characterizing the space environment and its effects on activities in space. SSA combines positional information on the locations of objects in Earth orbit using optical telescopes and radars, commonly known as space surveillance, with information on space weather."[28] In other words, it is "the ability to know what objects are where at any given time in orbit and the condition of the local environment (e.g. space weather)."[29] As an example, in July 2007 the National Aeronautics and Space Administration (NASA) shifted the orbit of its Terra satellite to avoid the possibility of colliding with debris from the Chinese ASAT test.

It is considered an essential prerequisite for safe space operations and requires a network of globally-distributed sensors and data sharing between satellite owners, operators and sensor networks.

The United States, Russian Federation and some States in Europe have SSA capability. The US military maintains a world-wide network of radars and telescopes called the Space Surveillance Network (SSN).[30] The Russian Federation also operates a significant network of radars and telescopes and a satellite

25 UN Doc. A/RES/60/66, Transparency and Confidence-Building Measures in Outer Space. See <www.unoosa.org/pdf/gares/ARES_60_066E.pdf>.

26 *Supra* note 24.

27 Resolution 62/43, Russian and Chinese Transparency and Confidence-Building Measures in Outer Space. See also *supra* note 24.

28 Brian C. Weeden, *Space Situational Awareness Fact Sheet,* Secure World Foundation, 2010.

29 *Supra* note 3.

30 Some of these data are available publicly through the SSA Sharing Program on the Space Track website (www.space-track.org).

catalogue, but it does not make public any of this data. In Europe, "some states also operate powerful radars (e.g. the German TIRA, the French Graves, Scandinavian/multinational EISCAT, the UK's Fylingdales) and optical telescopes to monitor the space environment."[31] In addition, a group of commercial satellite operators (Inmarsat, Intelsat and SES) formed the Space Data Association (SDA), an international non-profit organization to increase the sharing of SSA data and cooperation between satellite operators.
However, due to the large number of SSA programs, there has been talk about developing an international civil SSA System of Systems, in order to reduce the risk of accidental collisions in space.[32] One of the reasons to consider this proposed is that most of space actors do not have SSA capability; one international SSA system could make it available for everyone.

5.2 Space Traffic Management

The scenario of "increase space debris, growing number of launches from more and more launch sites and spaceports, the participation of non-governmental entities, the positioning of satellite constellations and the advent of reusable launch vehicles"[33] are reasons to consider space traffic management an important long-term technical measures to be taken.
An IAA study defined space traffic management as "the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference."[34] This comprises technical and regulatory provisions for guaranteeing safe and interference-free access into outer space, operations in outer space, and return from outer space to Earth. It has the ability to design a maneuver to avoid collisions. If can avoid collisions, avoid future space debris in the space environment. For this reason it is also being discussed under UN COPUOS agenda item "Long-term sustainability of outer space activities.

5.3 Debris Removal

Debris Removal is a long-term measure to remediate the growth of the orbiting debris, since it is not technically or economically feasible to allow it to remain. Certain techniques have been proposed for performing active debris removal (ADR). According to Brian C. Weeden,[35] technical advisor for Secure World Foundation, there are a number of technologies and techniques proposed for active debris removal in low LEO and in GEO orbits. He also mentioned that:

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31 A Report of the International Interdisciplinary Congress on Space Debris, at 13.
32 *Supra* note 11, at 4.
33 International Academy of Astronautics (IAA), *Cosmic Study on Space Traffic Management,* edited by Corine Contant-Jorgenson, Petr Lála, Kai-Uwe Schrogl, 2006, available at <http://iaaweb.org/iaa/Studies/spacetraffic.pdf>.
34 *Id.*, at 17.
35 *Supra* note 10.

> "LEO is the region of Earth orbit below 2,000 km altitude. It contains the vast majority of space debris, active spacecrafts and spacecraft carrying humans in Earth orbit. From this region, space debris will re-enter the Earth's atmosphere trough a process known as natural decay. For smaller pieces of debris in this region, the ADR techniques use lasers, either ground or space-based. Larger pieces of debris in this region can be removed through rendezvous operations, where an ADR spacecraft can approach the targeted piece of debris and harpoons. In GEO, the second most crowed region of Earth, which is situated 35,786 km above the Earth, the technique is to move debris object into post-mission disposal (PMD) orbit at the end of their operational lifetime, which is at least 235 km above GEO belt."[36]

Besides technical measure challenges, the ADR technique has also faced some legal issues that has to be solved: i) there is no definition of the term "space debris" in any of the space law treaties and there is no clear distinction between a function satellite and non-functional space debris; ii) Article XIII of the Outer Space Treaty[37] and Article I of the Liability Convention[38] stipulate that a space object is under the jurisdiction and control of the Launching State; iii) liability from ADR operations and, iv) intellectual property rights.[39]
Studies have indicated that the LEO orbit population will continue a steady increase in the next 200 years. It also shows that if two objects could be removed per year, starting from the year 2020, the debris population growth will be approximately reduced by half. If five objects could be removed per year, then the LEO population in the next 200 years can be maintained at a level similar to the current environment.[40]

6 Developing Legally-Binding Rules

At the international level, during the COPUOS Legal Subcommittee sessions, the task of achieving successful proposals for developing legally-binding rules

36 *Id.*, at 3-4.
37 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 UST 2410, 610 UNTS 205.
38 Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST 2389, 961 UNTS 2389.
39 *Supra* note 10. See also Tanja Masson-Zwaan, *Legal Challenges of Active Space Debris Removal*, Active Space Debris Removal Symposium, Netherlands Space Society, 2012.
40 J.C.Liou, *Low-Earth Orbit Environment Remediation with Active Debris Removal,* Johnson Space Center. See <http://research.jsc.nasa.gov/BiennialResearchReport/2011/273-2011-Biennial.pdf>. See also UN doc. A/AC.105/C.1/2012/CRP.16, A Report of the International Interdisciplinary Congress on Space Remediation and On-Orbit Satellite Serving, 2012, available at <www.oosa.unvienna.org/pdf/limited/c1/AC105_C1_2012_CRP16E.pdf>.

on space debris matters has been extremely hard. Most spacefaring nations consider the introduction of a new legal instrument on space debris at the international level premature, owing to the fact that States are still continuing to implement the UN Space Debris Mitigation Guidelines at the national level. On the other hand, others consider this matter to be very important, due to the threat to the space environment.

The matter of space debris was initially discussed in the COPUOS Scientific and Technical Subcommittee in 1994, when the General Assembly (resolution 48/39) endorsed the recommendation of the Committee to add a new item entitled "space debris" to the agenda of that Subcommittee.

The COPUOS Legal Subcommittee in 2008, at its forty-seventh session, agreed to included "General exchange of information on national mechanisms relating to space debris mitigation measures", as a new single item on the agenda of the Subcommittee at its forty-eight session.[41] However, this item did not involve the discussion of substantive legal matters.

6.1 Czech Republic Proposal

In 2010, at the forty-ninth session of the UN COPUOS Legal Subcommittee, Prof. Vladimir Kopal, expert on space law and member of the Czech Republic delegation, proposed a working paper on behalf of his delegation.[42] He proposed: "the Subcommittee should include on its agenda a new item to review the legal aspects of the Space Debris Mitigation Guidelines of the UN COPUOS, with a view to transforming the Guidelines into a set of principles on space debris to be elaborated by the Legal Subcommittee and adopted by the General Assembly.[43] The Czech Republic delegation intended to retain the proposal for possible discussion at subsequent sessions of the Subcommittee.[44]

As pronounced by the Czech Republic delegation during the fifty-first session of the UN COPUOS Legal Subcommittee in 2012, its delegation has been a long time supporter for the consideration of item "space debris" in the UN COPUOS and both its Subcommittees. The delegation actively participated in the development of the UN Space Debris Mitigation Guidelines by the UN COPUOS Scientific and Technical Subcommittee. According to its statement during that session:

41 UN doc. A/AC.105/917, para. 150, available at <www.unoosa.org/pdf/reports/ac105/AC105_917E.pdf>.

42 Working paper submitted by the Czech Republic at 50th session of the COPUOS Legal Subcommittee, March, 2011. See UN doc. A/AC.105/C.2/L.283, available at <www.unoosa.org/pdf/limited/c2/AC105_C2_L283E.pdf>.

43 *Id.*, item 1.

44 A/AC.105/942, paras. 169 and 170 (b). See <www.unoosa.org/pdf/reports/ac105/AC105_942E.pdf>.

> "…although Czech Republic delegation considers the guidelines an important step in the struggle for the mitigation of space debris, they remain only advisory technical standards to be implement by States and international organizations on a voluntary basis through their own practices and procedures, and do not mentions the protection of the environment as one of their aims. The guidelines are not legally binding under international law. Thus, they do not establish any legal duty to comply with them. And their violation would not generate any legal responsibility and liability in the case of damage caused by such misconduct."[45]

In additional, "the mandate of the Legal Subcommittee in its agenda item - General exchange of information on national mechanisms relating to space debris mitigation measures - does not include the consideration of the substantive legal problems of space debris or a detailed analysis of the legal content and effectiveness of the UN Space Debris Mitigation Guidelines. It only brings to the attention of the Subcommittee the results of their efforts with respect to establishing national policies on space debris."[46] As a result, the delegation of the Czech Republic and some other member States of the Committee, under those considerations, "proposed at the fifty-third session of the Committee, in 2010, the inclusion of the above-mentioned new item in the agenda of the Legal Subcommittee. Its consideration under a working plan should result in the elaboration of a set of principles based on the Guidelines of the Committee to be enacted in a special resolution of General Assembly. Such principles would belong to the series of UN Principles relating to outer space activities that were adopted during the 1980s and 1990s."[47] In addition, the Czech Republic delegation proposed:

> " …the draft of resolution, in its preamble, could include three important ideas expressed in the latest General Assembly resolution on international cooperation in the peaceful uses of outer space (resolution 65/97),[48] namely the importance of international cooperation in developing the rule of law, including the relevant norms of space law and their important role in international cooperation for the exploration and use of outer space for peaceful purposes; recognition that space debris is an issue of concern to all nations; and acknowledgement of the importance of further developing the legal framework to strengthen international Cooperation in this field."[49]

It also considered that the provisions based on the text of the Guidelines, the principles as a legal document, should establish some issues, including: a) the

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45 Statement by the Czech Republic delegation during the 51st session of the Legal Subcommittee of the UN COPUOS, available at <www.mzv.cz/mission.vienna/en/statement_by_vladimir_kopal.html>.

46 *Id*., item 10.

47 *Id*., item 11.

48 Resolution A/RES/65/97. Available at <www.unoosa.org/pdf/gares/ARES_65_097E.pdf>.

49 *Supra* note 45, item 12.

definition of space debris; b) declare the responsibility of States under article VI of the Outer Space Treaty and the liability under article VII of the Liability Convention for damage caused by space debris; c) responsibility and liability to the space activities carried out by international organizations; d) recognize the right of any State or international organization to intervene, in cooperation with other States concerned, with regard to dangerous pieces of space debris, particularly in the most exposed parts of space; e) a system for the peaceful settlement of disputes.

For the sake of all of these issues, the text of the Guidelines was addressed to the draft International Instrument on the Protection of the Environment from Damage Caused by Space Debris, adopted by the International Law Association, at its sixty-sixth Conference, held in Buenos Aires in August 1994.[50]

The Czech Republic delegation also added that a set of principles developed by the Legal Subcommittee in close cooperation with the Scientific and Technical Subcommittee, endorsed by the Committee and adopted by the UN General Assembly, would become a satisfactory form of an international instrument on space debris for the present time and near future.

There was no consensus on the Czech Republic's proposal nor was there consensus in subsequent sessions in 2011 and 2012. In 2011, no consensus was achieved by the United States, Russian Federation, France and Japan; and in 2012, by the United States, Russian Federation and France. They argued that the discussion of "the legal aspects of space debris would be premature and could confuse and disorient private companies already involved in the process of adopting rules on the issue based on the 2007 Guidelines. Moreover, the discussion would create a new climate of uncertainty for businesses, which would not know which statement below."[51]

6.2 General Exchange of Information and Views on Legal Mechanisms Relating to Space Debris Mitigation Measures, Taking into Account the Work of the Scientific and Technical Subcommittee Agenda Item

After two consecutive failures to reach a consensus on the Czech Republic's proposal in 2010 and 2011, during the UN COPUOS Legal Subcommittee sessions a consensus for the new agenda item was achieved.

According to the Report of the COPUOS Legal Subcommittee on its fiftieth session, "some delegations expressed the view that the title of the new agenda item proposed in the Czech Republic working paper could be shortened to include only a review of the legal aspects of the Space Debris Mitigation Guidelines of the Committee and should not include the matter of transforming the

50 See Karl-Heinz Böckstiegel, *The Draft of the International Law Association for a Convention on Space Debris*, Proceeding of the 38th Colloquium on the Law of Outer Space, p. 69-77, 2005.

51 José Monserrat Filho, *Lixo Espacial: debate difícil de acontecer*, Ciência Hoje magazine, July 2012.

Guidelines into a set of principles."[52] Moreover, "some delegations expressed the view that matters relating to the review of legal aspects of space debris at the international level could be considered jointly with the item currently on the agenda of the Subcommittee, entitled "General exchange of information on mechanisms relating to space debris mitigation".[53]
Therefore, there was a changes of the UN COPUOS Legal Subcommittee agenda item. The item "General exchange of information on national mechanisms relating to space debris mitigation measures" was replaced to "General exchange of information and views on legal mechanisms relating to space debris mitigation measures", taking into account the work of the Scientific and Technical Subcommittee.
This new agenda item will start to be discussed in the next UN COPUOS Legal session, and represents the first step to discuss substantive legal matters related in this issue and developing legally-binding rules. As also noted by José Monserrat Filho,[54] expert on space law and member of the Brazilian delegation in the UN COPUOS, the approval of this new item opens the doors for discussion of legal implications of space debris, which was refused for many years at the international level.

7 Conclusions and Recommendations

- It is most certainly the time for developing legally-binding rules for space debris at the international level. It is clear that, besides important technical measures rules, the developing of binding rules must be taken in order to achieve an effective sustainable development of outer space activities.
- Efforts in the present and future are essential tools for outer space sustainability. At present, it is becoming increasingly clear that mitigation measures will not be enough to ensure a sustainable future for space operations, and thus remediation measures must be taken in the future. UN Space Debris Mitigation Guidelines are important technical measures that have been achieved. But its effort did not raise significant policy, legal and economic challenges. That is why the UN COPUOS Long-term sustainability of outer space activities working group has an important role to bring challenges to be implement for the long-term sustainability of outer space activities; as well as to examine and propose measures to ensure the safe and sustainable use of outer space for peaceful purposes and the benefit of all countries. It must also to keep its information exchanges between private sectors. The use of transparency and confidence-building measures, as tool of diplomacy

52 Report of the COPUOS Legal Subcommittee, UN doc. A/AC. 105/990, para. 165, available at <www.unoosa.org/pdf/reports/ac105/AC105_990E.pdf>.
53 *Id.*, para. 166.
54 *Supra* note 51.

and international relations, must be more frequent in the space scenario due enormous difficulty policy to reach a consensus in space matters. In the future, efforts to establish an international civil SSA system must be kept in order to reduce the risk of accidental collisions in space, and to have a SSA system available for all space actors. International space traffic management represents a sustainable path for space activities. As space traffic increases, it has an important role to provide international regulation of space. In relation to debris removal, it will face several challenging policy and legal questions. Therefore, cooperation, collaboration, and contributions at the national and international levels will be needed to move this effort forward for space environment remediation.

- The Czech Republic's proposal doubtless resulted in the first step to develop legally-binding rules. It must be addressed during the next UN COPUOS Legal Subcommittee sessions, under the new agenda item approved, all space debris legal aspects addressed by the Czech Republic's proposal, in particular the Buenos Aires International Instrument on the Protection of the Environment from Damage caused by Space Debris, an instrument already developed for the protection of both space and Earth environments. This instrument could be a support for future efforts for developing legally-binding rules on space debris. Under the approval of the new agenda item of the UN COPUOS Legal Subcommittee, a working group must be established for the development and analysis of substantive legal matters on space debris, taking into account Expert Group D (Regulatory Regimes and Guidance for Actors in the Space Arena) of the UN COPUOS Long-Term Sustainability of Outer Space Activities working group.