Prevention of an Arms Race in Outer Space (PAROS): Obstacles and Options

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1. Introduction

With the proliferation of missiles and satellites, the threat to outer space is increasing and space is becoming a province of warfare and of an arms race. A question is whether the transition from the *militarization* to the *weaponization* of space can be prevented, opening the "high frontier" for "space warfare".

There have been many attempts in the United Nations to prevent an Arms Race in Outer Space and to outlaw weapons against and from space objects. Commercial and civil space issues are considered and regularly addressed by the *UN Committee on the Peaceful Uses of Outer Space* (UNCOPUOS)[1] while military issues and challenges are discussed at the *Conference on Disarmament* (CD) and the *UN General Assembly* (UNGA) where issues such as PAROS are pursued. Other international agreements on space activities have been developed by The *International Telecommunication Union* (ITU) and the *Inter-Agency Space Debris Coordination Committee* (IADC) who address problems regarding the radio frequency spectrum, orbital slots, and space debris.

One problem with formulating a treaty to ban weapons from space is how to define what a space weapon is. As Michael Krepon points out[2], Russia and China have used the following definition when tabling a draft *Treaty on the Prevention of an Arms Race in Outer Space* (PAROS):

"any device placed in outer space, based on any physical principle, which has been specially produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth or in the Earth's atmosphere, or to eliminate a population or components of the biosphere which are important to human existence or inflict damage on them"[3]

As with most definitions, there are some difficulties with this. For example, it may not be possible to obtain international agreement on what a "specially produced or converted" device might be, but a bigger problem might be that this definition does not include weapons fired or launched from the ground or from aircraft. Ground and air-based weapons have been developed and tested and could be used to destroy or permanently or temporarily disable a satellite or space object.

More challenging than the definition of a space weapon is the lack of willingness to explore the possibility of taking PAROS seriously. In any case, determining whether a space-based object is a weapon or not is becoming more of an issue as an increasing number of states become dependent on vulnerable space technologies.

2. Civil Space Law

UNCOPUOS was established in 1959 by the UNGA to review international cooperation and devise UN programmes related to the peaceful use of outer space,

1 United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) - http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html.

2 "What is a Space Weapon?" by Michael Krepon, *Arms Control Wonk*, March 18, 2010 - https://www.armscontrolwonk.com/archive/402665/what-is-a-space-weapon/, accessed March 30, 2020.

3 "Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects", *Conference on Disarmament,* (CD/1839), 29 February 2008.

Table 1 – The Five Major Global Space Treaties

Treaty	Date	Parties	Signatures
Outer Space Treaty	1967	109	23
Astronaut Rescue Agreement	1968	98	23
Liability Convention	1972	96	19
Registration Convention	1975	69	3
Moon Treaty	1979	18	11

encourage research and dissemination of information on outer space, and consider legal issues arising from the exploration of outer space. As of 2019 UNCOPUOS has 96 member states and meets annually in Vienna. It incorporates a *Scientific and Technical Subcommittee* and a *Legal Subcommittee* and its decisions are implemented by the *UN Office for Outer Space Affairs* (UNOOSA)[4]. Questions relating to the militarization of outer space are dealt by the CD, based in Geneva. The stalemate at the CD has hampered progress on arms control in space.[5]

The need to create legal norms acceptable to all interested states, led UNCOPUOS to adopt consensus as a major procedural principle governing their space rule-making negotiations which have led to the five sets of legal principles governing space-related activities shown in Table 1.

The framework for international space law was ratified in the UN, at the height of the Cold War in 1967, and laid down in the *"Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies"* – commonly known as the *"Outer Space Treaty"* (OST)[6]. The OST was considered by the Legal Subcommittee in 1966 and agreement was reached in the GA in the same year. The Treaty was opened for signature in January 1967 and entered into force in October 1967.

The OST enshrines the principle that space is a *Global Commons* to be used for peaceful purposes for the benefit of all humankind and its concepts and some of its provisions were modelled on the *"Antarctic Treaty"* of 1961. Both Treaties were attempts to prevent *"a new form of colonial competition"* and the possible damage that self-seeking exploitation might cause – but these ideals are not without practical difficulties (e.g. the "*tragedy of the commons*"). The OST provides the basic framework for international space law, including in particular, the following principles:

- the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind (Article I)
- outer space shall be free for exploration and use by all States (Article I)
- outer space is not subject to national appropriation by claim of sovereignty,

4 United Nations Office for Outer Space Affairs (UNOOSA) - http://www.oosa.unvienna.org/oosa/SpaceLaw/treaties.html

5 C. Singer, Space Weapons and the Conference on Disarmament, *INESAP Information Bulletin*, No. 20, August 2002, pp. 25-26.

6 "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (The Outer Space Treaty)", United Nations Office for Outer Space Affairs, 1967 – detailed at http://www.unoosa.org/oosa/SpaceLaw/outerspt.html.

by means of use or occupation, or by any other means (Article II)
- states shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner (Article IV.1)
- the establishment of military bases, installations and fortifications on the Moon and other celestial bodies is forbidden (Article IV.2).

The other major agreements shown in Table 1 expand on relevant sections of the OST. In particular, the 1979 *"Agreement Governing the Activities of States on the Moon and Other Celestial Bodies"* [7] (also known as the *Moon Treaty*), reaffirms a number of OST principles but also declares the Moon to be the *"common heritage of mankind"* and calls for the creation of an international regime to govern the exploitation of the natural resources of the Moon.

The common principles of these major treaties are severely challenged by the growing military reliance on space-based assets. Donald Rumsfeld's *2001 Space Commission Report* [8] highlighted the vulnerability of satellite systems and concluded that it was necessary for the US to completely dominate all aspects of space in order to ensure an adequate defence of their space assets and to protect against a possible *"Space Pearl Harbor"*. This centred the prevailing US military thinking around concepts such as 'full spectrum dominance' in which it was important to *"pursue superiority in space through robust ... defensive and offensive capabilities"*, maintain a fully integrated *"land, sea, air and space war-fighting system"* [9] and integrate civil and commercial space operations with military ones.[10] To achieve this the US Air Force adopted a doctrine of *"Counterspace Operations"* – *"the ways and means by which the Air Force achieves and maintains space superiority"* - the *"freedom to attack as well as the freedom from attack"*.[11] The imperative of power projections towards space dominance is contrary to the principle of space as a "common heritage of mankind", which should not be subject to conflict, private ownership, or national appropriation.[12]

In addition to the multilateral treaties dealing specifically with space and space activities, the international community has agreed a number of other conventions relevant to space activities (see Table 2). In particular, the 1963 *"Partial Nuclear Test Ban Treaty"* (PTBT) bans nuclear explosions in outer space; the 1977 *"Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques"* (ENMOD Convention) bans the use of certain environmental modification techniques aimed at changing the dynamics, composition, or structure of outer space, and the 1932 *"International Telecommunications Convention"* contains provisions relating to space communications (in particular Article 45 aims to prevent harmful interference with the services or communications of its members and Article 33, note 20, provides that all countries should have equal access to radio frequencies and the geostationary satellite orbit, *"taking into account the special needs of the developing countries."*

7 United Nations Office for Outer Space Affairs, *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (The Moon Treaty), 1979 – detailed at http://www.oosa.unvienna.org/oosa/SpaceLaw/moon.html.

8 "Report of the Commission to Assess United States National Security Space Management and Organization", January 2001 – available from: https://aerospace.csis.org/wpcontent/uploads/2018/09/RumsfeldCommission.pdf

9 *"Vision for 2020",* United States Space Command, February 1997 – available from http://www.fas.org/spp/military/docops/usspac/visbook.pdf.

10 "Joint Vision 2020 Emphasizes Full-spectrum Dominance", by J. Geramone, *American Forces Press Service*, US Department of Defense, June, 2000 http://www.defenselink.mil/news/Jun2000/n06022000_20006025.html.

11 "Counterspace Operation", Air Force Doctrine Document 2-2.1, August 2004 – available from: https://fas.org/irp/doddir/usaf/afdd2_2-1.pdf

12 K.-U. Schrogl (2010)" Space Law and the Principle of Non-Appropriation", in: W. Bender, R. Hagen, M. Kalinowski, J. Scheffran (Eds.), *Space Use and Ethics*, Münster: agenda, pp. 251-253.

Table 2 – Other Global Space Conventions and Treaties

Treaty	Date	Ratifications	Signatures
Partial Nuclear Test Ban Treaty	October 1963	126	10
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques	December 1976	78	48
The International Telecommunications Convention	The current Constitution and Convention was adopted in 1992 in Geneva. Subsequent conferences have only adopted amendments.		193 (members)

As well as discussing and developing treaties and agreements, every year UNCOPUOS invites member states to submit reports on national research on space debris, the safety of space objects with nuclear power sources on board and any problems of their collisions with space debris. The information received is then disseminated by the UN[13]. In June 2007, UNCOPUOS also adopted *"Space Debris Mitigation Guidelines"* - member states pledged to implement *"to the greatest extent feasible."* The 2007 session of UNCOPUOS also agreed on a draft resolution on the practice of states and international organisations in registering space objects to be submitted to the General Assembly, and approved a workplan for the *"UN Platform for Space-based Information for Disaster Management and Emergency Response"* (UN-SPIDER).[14]

3. Peace in Space?

Every year since 1982 the UN General Assembly discusses resolutions relating to activities in outer space.[15] Table 3 shows some additional principles on the use of space which have been adopted. Every year a resolution calling for *"International Cooperation in the Peaceful Uses of Outer Space"* is adopted, usually without a vote. There are also regular discussions on PAROS[16] and on *"Transparency and Confidence Building Measures"* (TCBMs) in Outer Space. Both resolutions are adopted by an overwhelming majority of UN member states with every country voting in favour of the resolution - except for the US who usually vote against and Israel who abstain. The US argues that the existing multilateral arms control regime is sufficient and that there is no need to address a non-existent threat but other countries view this suspiciously and are frustrated that progress cannot be made on this subject until the most powerful country in space

13 The reports from 2004-2010 are available from: http://www.unoosa.org/oosa/en/natact/sdnps/index.html

14 United Nations Office for Outer Space Affairs, UN-SPIDER, 2006 - http://www.unoosa.org/oosa/en/unspider/index.html

15 An index of resolutions can be found here - http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/gavotes.html

16 For much more information and coverage of UN discussions on PAROS see the "Reaching Critical Will" web site - http://www.reachingcriticalwill.org/resources/fact-sheets/critical-issues/5448-outer-space

Table 3 - Principles on Space adopted by the UN General Assembly

Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (1963)	Space exploration should be carried out for the benefit of all countries. Outer space and celestial bodies are free for exploration and use by all states and are not subject to national appropriation by claim of sovereignty. States are liable for damage caused by spacecraft and bear international responsibility for national and non-governmental activities in outer space.
Principles on Direct Broadcasting by Satellite (1982)	All states have the right to carry out direct television broadcasting and to access its technology, but states must take responsibility for the signals broadcasted by them or actors under their jurisdiction.
Principles on Remote Sensing (1986)	Remote sensing should be carried out for the benefit of all states, and remote sensing data should not be used against the legitimate rights and interests of the sensed state.
Principles on Nuclear Power Sources (1992)	Nuclear power may be necessary for certain space missions, but safety and liability guidelines apply to its use.
Declaration on Outer Space Benefits (1996)	International cooperation in space should be carried out for the benefit and in the interest of all states, with particular attention to the needs of developing states.

agrees.

The PAROS resolution calls for states to refrain from actions contrary to the objective of PAROS and *to "contribute actively"* to that objective. A PAROS treaty would also prevent any nation from gaining a military advantage in space and reduce the military use of space. In 2007, the UN Secretary General released a report on *"Transparency and confidence-building measures in outer space"* on behalf of the European Union which proposed the development of a comprehensive code of conduct in space and suggested guidelines for the general principles, scope, and participation for such a code. A first draft of a "*Code of Conduct*" was published by the EU in 2008 and a revised draft released September 2010, with the latest version being presented in June 2015. It calls on countries to refrain from actions that would damage or destroy other satellites or interfere with their communications, and to minimise the risk of collisions and limit the creation of orbital debris.

In 2008 Russia submitted a draft PAROS treaty that would commit State Parties to practice agreed confidence-building measures and also to refrain from placing into orbit objects which contain any type of weapon.

- In June 2014 Russia and China jointly submitted to the CD an updated draft of a treaty on the *"Prevention of the placement of weapons in outer space, the threat or use of force against outer space objects"* (PPWT) and in December 2018 a resolution was adopted on *"No first placement of weapons in outer space"* by the UNGA, these two measures were welcomed

by the Group of 21 (Non-Aligned nations in the CD) in 2019 and they issued a statement on PAROS[17] which reiterates much of the original message of the OST but also *"stresses that the growing use of outer space requires all states to take actions to ensure greater transparency, confidence building measures and better information"* and *"recognizes that the prevention of an arms race in outer space would avert a grave danger for international peace and security."* The Group also welcomed the UNGA's adoption of a resolution titled *"Further practical measures for the prevention of an arms race in outer space"* in December 2017, which urged the CD to *"immediately commence negotiations on an international legally binding instrument on the prevention of an arms race in outer space, including, inter alia, on the prevention of the placement of weapons in outer space".* In October 2018, the First Committee of the UNGA adopted four resolutions:

- *Prevention of an Arms Race in Outer Space,*
- *Further Practical Measures for the Prevention of an Arms Race in Outer Space*,
- *No First Placement of Weapons in Outer Space*, and
- *Transparency and Confidence-Building Measures in Outer Space*

The US voted 'no' to all of them.

So, despite widespread concern and even though some international agreements have been reached in the past, there is a lack of any real progress along the lines of a strong and binding PAROS agreement. Space activities are developing rapidly, and certain members of the international community are not currently working in cooperative and conciliatory ways. Most countries are now using space technologies in one way or another and the advent of mini-satellites for communications and environmental monitoring, cheaper launches are on offer to a wider range of countries. Commercial actors and even wealthy individuals are increasingly the owners of spacecraft, satellites and information, and further incentives for space exploitation were introduced in April 2020 when President Trump signed an Executive Order that formally recognises the rights of private interests to claim resources in space - flying in the face of the OST.

The military use of space is also set to grow considerably. In February 2019, Donald Trump announced the establishment of a US Space Force, which the White House described as a sixth US military branch. The president has directed the Department of Defense to put forward a legislative proposal that would *"organize, train and equip our space warfighters with next-generation capabilities"* so as to *"maximize warfighting capability and advocacy for space while minimizing bureaucracy."* The UK, France and NATO are now also developing Space Forces and Japan and South Korea have similar plans and Russia, China and India have had extensive military space programs for many years and states are now progressing further with developing and implementing systems that can be used against space-based objects – whether they be satellites or missiles.

4. Risk Reduction and Space Security

In a crisis, vulnerable space objects can seriously endanger the decision-making process of states and give rise to unstable situations. Thus, risk reduction in space is a major component of space security. Space objects are designed for a hostile space environment that is characterized by vacuum, radiation, temperature extremes and a limited energy supply, stress of launch and re-entry. Space systems can fail for a variety of reasons:

17 "Statement on the Prevention of an Arms Race in Outer Space (PAROS), submitted to the UN Conference on Disarmament by the Group of 21 (G-21), September 2019

component failure and degradation; errors in design, development, production, programming or operation; interruption of ground communication caused by accidents, jamming or ground attacks; accidental collision with space debris and spacecraft; impact of meteorites, intentional physical attack; blinding of sensors; hacking; deception; or hijacking. In a concrete case, it might be difficult to trace a system failure back to a specific cause such as space debris or meteorite.

Vulnerabilities and threats would be considerably increased by advanced space weapons, such as maneuverable satellites, space mines, micro-satellites, kinetic kill vehicles, chemical and nuclear explosives, or directed energy weapons (particle, microwave, laser). They would contribute significantly to the complexity and instability of the strategic situation, which ultimately would not serve the security interests of countries, including the United States.

To some degree, the survivability of space objects against some of the potential disturbances and threats can be increased by passive or active protection measures, including the physical hardening and shielding of important satellite components, maneuverability to evade attacks, the use of dummies, or active countermeasures. Some of these measures are costly and do not provide security against all kinds of attacks and technologies. For key satellites in the most advanced space powers, some or all of these measures have already been implemented. Within the existing framework of international space law, confidence-building measures can contribute to stabilizing international security including:

- the advanced notification and more detailed information about space launches and experiments (for example, with lasers);
- the establishment of a crisis hotline between major missile and space powers;
- a code of conduct for responsible space behavior, learning from the process of the Missile Technology Control Regime (MTCR); [18]
- an improved international monitoring system and information exchange; and
- strengthened international space cooperation that improves transparency and reduces incentives for indigenous space development.

18 In 2004 the Stimson Center, with U.S. NGO experts, drafted a Model Code of Conduct for Responsible Space Faring Nations. The full text of the Model Code of Conduct can be found at www.stimson.org/space.

- In addition, traffic rules in space (*Rules of the Road*) can help to avoid accidents and misunderstandings and create trust. These include:
- surveillance and communication systems;
- the advanced notice of rocket launches;
- keep-out safety zones, minimum flyby distances, restraints on space maneuvers and speed limits around satellites to increase warning time against attack and reduce efficiency of attack;
- satellite immunity and non-interference with satellites;
- reduction of space debris.

A combination of satellite hardening, confidence building and rules of the road might better protect satellites against existing residual (non-dedicated) space threats such as attacks with intercontinental ballistic missiles (ICBMs) and maneuverable satellites, with radio or laser beams not explicitly developed for weapon purposes. High-altitude nuclear explosions are a severe risk for all electronic components in space, not just from direct impact but even more so from captured radiation in the Van Allen radiation belt.

To strengthen risk reduction and space security, the creation of an international security regime (Space Sanc-

tuary) to reduce threats in space is important. In 2009 the EU circulated proposals for an international code of conduct, in which guidelines for behavior in space should be laid down, which limit the generation of space debris, create transparency and improve other elements of international cooperation. The aim is to reduce the risk of collisions in space and to create a peaceful, safe and sustainable space environment. The US rejected these and other proposals which, they claim, limit its national sovereignty and dominance.

5. Partial Space Arms Control Options

Risk reduction and rules of the road alone cannot exclude destruction by advanced ASAT weapons and an effective missile defense system in space. An arms race in space can only be effectively prevented through preventive arms control and disarmament, which create suitable options for intervention and control at an early stage in weapons development.[19] Operational space weapons have not yet been developed. One of the reasons is that the development of the required technologies is very costly and turns out to take much longer than anticipated. Dual-use—exemplified not only in space-weapons capabilities of missile defense components but also in the inherent civil-military ambivalence of space technology such as rockets and satellites—blurs the boundary to space weapons to some degree.

Further international agreements to restrict the militarization of space have not yet been realized. To substantially diminish the emerging threats from space weapons, additional partial arms control measures could help, which by agreement would restrict or ban certain kinds of weapons or weapon uses. These could include the following:[20]

- A ban on the testing, deployment and use of weapons above a specific altitude would relegate weaponization to low-Earth orbits and keep the remaining outer space a weapon-free zone. Possible altitudes could range from 500 km to 5,000 km in order to protect space objects beyond that range. Protecting high-orbit navigation satellites and geostationary communication and early warning satellites is highly important to military and commercial interests. However, allowing weapons development in low-Earth orbits could open the door to space weaponization, and it would not preclude the development of advanced low-Earth orbit weapon systems that could later be extended to higher orbits.
- The legal and physical protection of manned missions and the prohibition of manned military space operations could prevent people from being involved in space warfare. Most important, it would protect manned space stations by keep-out zones and shielding them against space debris and some forms of attack.
- Certain types or deployment modes of space weapon systems and technologies could be banned—in particular, ASAT or BMD systems, or offensive weapons. Laser and other kinds of directed-energy weapons could be excluded, whether ground-based or space-based. Small satellites below a specif-

19 G. Neuneck, A. Rothkirch, The Possible Weaponization of Space and Options for Preventive Arms Control, German Journal of Air and Space Law, Vol. 55, Winter 2006, No. 4, 501-517.

20 This and the following section relies on: Altmann J, Scheffran J (2003) New Rules in Outer Space: Options and Scenarios. In: Security Dialogue 34 (1), S. 109–116; R. Hagen, J. Scheffran, International Space Law and Space Security, in: M. Benkö, K.-U. Schrogl (Eds..), *Space Law: Current Problems and Perspectives for Future Regulation*, Eleven International Publishing, 2005, 273-301; J. Scheffran, Options for Rules in Outer Space, *INESAP Information Bulletin*, No.20, August 2002, 9-14. Scheffran, J. (2008) *Strengthening International Security Through International Law: The Case of Nuclear, Missile and Space Weapons*. In: Richard Falk, David Krieger (Eds.) At the Nuclear Precipice: Catastrophe or Transformation? Palgrave Macmillan, pp. 185-208.

ic size limit or weight limit could be restricted.

- States could restrict particular stages in the life cycle of a weapon such as research, development, testing, production, deployment or use. For example, a moratorium on ASAT testing was established in the mid-1980s between the United States and the Soviet Union. A ballistic missile flight test ban was also discussed at that time.
- Specific limits on interception speeds and altitudes or the size of mirrors and power levels could be agreed.

6. Proposals for Comprehensive Space Arms Control and Space Weapons Ban

Once established, partial arms control measures could be integrated into more comprehensive arms control regimes in space, including a global ban on weapons against objects in space and from objects in space against any target. Comprehensive space arms control would seek to ban certain kinds of weapon systems completely at an early stage to effectively prevent an arms race in space before these weapons are tested or become operational. Space weapons can be defined as "*systems based either terrestrially or in space for anti-satellite missions; or systems based in space designed to attack terrestrial targets*."[21] A comprehensive arms control regime has the advantage of being politically comprehensible and attractive to the general public. Such regimes require an unprecedented degree of cooperation.

Some states and representatives of civil society have long been pushing for a space weapons ban under international law.[22] Since the 1980s there have been a number of initiatives against the weaponization of space, including proposals by France and the Soviet Union (1983) to ban anti-satellite weapons. The *Union of Concerned Scientists* in the USA drew up a draft treaty banning anti-satellite weapons in early 1983. In 1984 in Göttingen, German scientists presented a "*Draft Treaty on the Limitation of the Military Use of Space*", which proposed a ban on weapons against space objects and space-based weapons against any target, including development, testing and deployment.[23] Russia and China tabled proposals for a space weapons ban at the CD in 2002. *The Space Preservation Act* was introduced in the U.S. by Congressman Dennis Kucinich in 2001, 2002 and 2005 and in each case the bill was referred to committee but "*no further action ensued*".

A global ban on weapons against objects in space and from objects in space against any target would prohibit development, testing, and deployment of such systems. Banning space weapons would focus on those systems that are "*specially designed*" to destroy space objects (including ASATs on the ground, on the sea, or in the air), and on space objects themselves which are specifically designed to destroy other targets regardless of their mode of operation. The key point of such agreements would be the ban on the use of ASAT weapons, i.e. the obligation not to destroy or damage any space objects of other states, disturb their function or change their trajectory. In order to prevent the im-

21 T. Hitchens, Update on U.S. Military Space Policy and Strategy, 8 June 2005; www.cdi.org.

22 For an overview of proposals see: *INESAP Information Bulletin*, No.20, August 2002; www.inesap.org/sites/default/files/inesap_old/bulletin20/bulletin20.htm; Scheffran J (2002) Militärische Nutzung des Weltraums und Möglichkeiten für Rüstungskontrolle im Weltraum. Völkerrechtliche Grundlagen, politische Rahmenbedingungen und technische Möglichkeiten. Gutachten für den Deutschen Bundestag, Berlin/Potsdam.

23 See: H. Fischer, R. Labusch, E. Maus, J. Scheffran, Entwurf eines Vertrages zur Begrenzung der militärischen Nutzung des Weltraums, in: R. Labusch, E. Maus, W. Send (Eds.), *Weltraum ohne Waffen*, München, 1984, pp. 175187. For the English version, see: Treaty on the Limitation of the Military Use of Outer Space, in: J. Holdren, J. Rotblat (Eds.), *Strategic Defences and the Future of the Arms Race*, New York, 1987; J. Scheffran, The Göttingen Proposal for a Space Treaty, *INESAP Information Bulletin*, No.20, August 2002.

provement or expansion of existing ASAT capacities, a test ban is necessary. Since the development of weapons in space creates incentives for their destruction, an agreement should also extend to space-based weapon systems that are directed against targets in space, air space or on earth.

This does not resolve the problem of dual use-capable systems but would exclude a large class of the most threatening systems and activities. A residual risk from non-dedicated systems (such as maneuverable satellites or rockets) remains, but this problem needs to be dealt with by a set of measures to reduce these residual risks (including satellite hardening, improved monitoring, security concepts, etc.). A comprehensive approach could integrate risk reduction measures and partial agreements in a phased step-by-step approach, as has been discussed in incremental-comprehensive approaches to nuclear disarmament. For each step, efforts and benefits must be balanced. The overall concept has to be chosen in a way that best serves space security.

Depending on how far-reaching the agreements go, and which systems are restricted, there are different requirements for their verifiability. In principle there are a number of verification means on earth or in space that can be used for this purpose.[24] A verification system could also extend to the control of ballistic missiles and anti-missile systems, with a test ban being the most verifiable.

There is no catch-all solution to PAROS but a combination of multiple measures integrated within a comprehensive framework is a way forward. As pointed out by Detlev Wolter, the peaceful use of space is an essential cornerstone in the concept of "*common security*" in outer space, which includes the following measures:[25] "*the prohibition of active military uses of a destructive nature in the common space; a comprehensive package of confidence-building measures with multilateral satellite monitoring and verification systems as well as a protective regime for peaceful space objects based on immunity rules for satellites, such as 'rules of the road' and a 'code of conduct*.'" He suggests negotiation of a multilateral "*Treaty on Common Security in Outer Space*" (CSO Treaty) as the adequate mechanism to implement the Outer Space Treaty. This should be accompanied by the establishment of an *International Organisation for Common Security in Outer Space*, which would be tasked with monitoring the implementation of the agreement.

7. Conclusion

There are few diplomatic instruments and no active diplomacy initiatives among the major powers to act against the current military space arms race. Other areas of human activity have been addressed by the negotiation of agreements, codes of conduct, and/or treaties, but there appears to be little prospect of any of this happening for space.

There is a continuing need for diplomacy and the establishment of normative rules of behaviour, to reduce the risk of misperceptions and misunderstandings which may lead on to an accidental or avoidable war.

One thing that might be agreed by all parties is not to generate large amounts of space debris by testing ASAT systems on satellites. Such a test ban would be verifiable, and it would be in everyone's interest. This might then be extended to a voluntary ban on the testing and use of kinetic energy ASATs altogether. In 2007, in Vienna, Austria, UNCOPUOS agreed on a set of guidelines for the mitigation of space debris, which are slowly being implemented by many space-far-

24 Hagen, R., Scheffran, H. (2003) Is a space weapons ban feasible? Thoughts on technology and verification of arms control in space. Disarmament Forum 4(1): 41-51.

25 D. Wolter, *Common Security in Outer Space and International Law*, United Nations Institute for Disarmament Research (UNIDIR), Geneva, 2006.

ing states.

As outlined in section 1.2 above, there have also been efforts to set norms of behaviour in space but developing a code of conduct among major space-faring nations faces serious hurdles. However, it should still be possible because all major powers have invested heavily in space and they are still. War-fighting capabilities in space can only endanger those investments. Daniel Porras has suggested one possible way forward to ensure the long-term sustainability of space activities. This is a two-step approach: the development and adoption of "anti-satellite test" guidelines, and then the negotiation of a treaty on the prohibition of the destruction of objects in orbit.[26]

However, President Trump's *"Space Force"* is escalating and normalising the idea of space wars and progress towards a binding agreement on PAROS can only really be made through the joint efforts of the US, Russia and China. Although this does not look likely now, some agreements to limit space activity have been made in the past even during the Cold War. Arms control treaties, such as SALT and START, have banned interference with surveillance satellites used for treaty verification - but did not extend to communications and global positioning satellites. New diplomatic efforts are urgently required to address new space infrastructure issues, but international cooperation and understanding on the Earth may have to be improved before limits on activities in outer space can be agreed.

Civil society plays a special role in preventing an arms race in space, improving arms control opportunities, and building trust between adversaries. In the past decades, critical scientific organizations, the peace movement and other NGOs have launched a wide range of initiatives, to mention INESAP's project *Moving Beyond Missile Defense*[27] or the *Global Network Against Weapons and Nuclear Power in Space*, both of which had been working together in the development of criteria for a peaceful and sustainable use of space.[28]

26 "Anti-satellite warfare and the case for an alternative draft treaty for space security" by Daniel Porras, Bulletin of the Atomic Scientists, 28 June 2019, pp 142-147

27 INESAP 2002; Tyson 2007; Scheffran et al. 2010.

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