GLOBAL IMPLICATIONS OF SPACE WEAPONISATION

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The paradox of today's world, where peace comes from deterrence and weaponisation; and even outer space, God's sole preserve, has not been left out.

There being no boundary line between 'air space' and 'outer space,' and with no universally or legally accepted demarcation line between the two, it gives a false notion that both these comprise a seamless and contiguous medium. The fallout is conflicting assumptions about the limits of sovereignty. However, most states agree that the sovereignty of a state would end at some point above the Earth, beyond which is the common heritage of mankind, where international law would reign supreme. Does this mean that any space-faring nation is free to explore, exploit and extract the benefits offered by outer space without regard to the future needs of other nations? Will our actions in space, specifically those with military objectives, be acceptable, or will these be monopolised by the advanced space-faring countries. Is there scope for '*responsible behaviour*' in space to preserve the space environment for future generations and protect it from space debris? These are some of the questions which raise the compelling need for enacting stringent laws and regulations governing the use of space.

The use of outer space is fast developing in two major areas. On the one hand, space technology is being used in a variety of roles to upgrade human lifestyles and for social upliftment. On the other hand, there are rapid developments in military applications and towards weaponisation of space for national

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objectives by a few leading space-faring nations. While the military applications are not a recent phenomenon, it is the increased pace of events like-Anti Satellite Weapons (ASAT) testing and Ballistic Missile Defence (BMD) programmes which are a cause of concern due to the potential these offer for the proliferation of space weapons.

EXISTING LEGAL FRAMEWORK AND REGULATORY MECHANISMS FOR SPACE ACTIVITIES

The legal and regulatory framework, also known as space law, much like general international law, comprises a variety of international agreements, treaties, conventions, and United Nations General Assembly (UNGA) resolutions as well as rules and regulations of international organisations. These are embodied in the *five international treaties* and *five sets of principles* governing outer space which have been developed under the auspices of the United Nations (UN). In addition to these international instruments, many states have national legislations governing space-related activities. This legal and regulatory framework addresses a variety of matters such as preservation of the space and Earth environment, liability for damages caused by space objects, settlement of disputes, rescue of astronauts, sharing of information about potential dangers in outer space, use of space-related technologies, and international cooperation. A number of fundamental principles guide the conduct of space activities, including the notion of space as the province of all mankind, freedom of exploration and use of outer space by all states without discrimination, and the principle of non-appropriation of outer space.[1]

1. "Space Law", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html. Accessed on April 10,2018.

The existing space governance mechanisms belong to the era of the Cold War and the space race between the superpowers of the 20th century. These are mostly non-binding and voluntary to those signatory nations which have ratified the agreements. Also, these agreements cater to the specific issues which arose during the Cold War rivalry. Though enacted during the 1960s and 1970s, these treaties have not been reviewed, but still form the basis for all guidelines and draft treaties today. The five core treaties were all negotiated through the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), a UN body created in 1958. The treaties, being generic, have left room for varied interpretation. In order to understand the implications of these treaties, a brief outline of the treaties is necessary.

The Outer Space Treaty (OST) is the primary legal instrument and the basis for all future treaties. It was founded on the principle of 'peaceful use' of outer space. The OST provides the basic framework on international space law.

INTERNATIONAL TREATIES AND AGREEMENTS

- **The Outer Space Treaty of 1967**: Also called the 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 (OST) is the primary legal instrument and the basis for all future treaties. It was founded on the principle of 'peaceful use' of outer space. The OST provides the basic framework on international space law, and includes the following principles[2]:
  - 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.
  - Outer space shall be free for exploration and use by all states.
  - Outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

2. "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html. Accessed on April 10, 2018.

- 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.
- The Moon and other celestial bodies shall be used exclusively for peaceful purposes.
- Astronauts shall be regarded as the envoys of mankind.
- States shall be responsible for national space activities whether carried out by governmental or non-governmental entities.
- States shall be liable for damage caused by their space objects.
- States shall avoid harmful contamination of space and celestial bodies.

The OST consists of 17 Articles mainly dealing with exploration of outer space, international cooperation, sharing of benefits and an embargo on the placement and testing of nuclear weapons in space.

- **The Rescue Agreement, 1968:** Also called the "Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space", the Rescue Agreement, elaborates on elements of Articles V and VIII of the Outer Space Treaty, and provides that states shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching state, and that states shall, upon request, provide assistance to the launching states in recovering space objects that return to the Earth outside the territory of the launching state.[3]
- **The Liability Convention, 1972:** Also called the "Convention on International Liability for Damage Caused by Space Objects", elaborating on Article 7 of the Outer Space Treaty, the Liability Convention provides that a launching state shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and be liable for damage due to its faults in space. It also provides for procedures for the settlement of claims for damages.[4]

3. "Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html. Accessed on April 11, 2018.
4. "Convention on International Liability for Damage Caused by Space Objects", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html. Accessed on April 11,2018.

- **The Registration Convention, 1975:** Also called the "Convention on Registration of Objects Launched into Outer Space", the Registation Convention was considered, and negotiated, for building upon the desire expressed by states in the Outer Space Treaty, the Rescue Agreement and the Liability Convention to make provision for a mechanism that provided states with the means to assist in the identification of space objects. The Registration Convention expanded the scope of the United Nations Register of Objects Launched into Outer Space that had been established by Resolution 1721B (XVI) of December 1961 and addressed issues relating to a state's responsibilities concerning its space objects.[5]
- **The Moon Agreement, 1979:** Also called the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies", the Moon Agreement was considered and elaborated by the Legal Subcommittee from 1972 to 1979. The Moon Agreement was adopted by the General Assembly in 1979 in Resolution 34/68. It was not until June 1984, however, that the fifth country, Austria, ratified it, allowing it to enter into force in July 1984. The Moon Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, providing that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, and that the United Nations should be informed of the location and purpose of any station established on those bodies. In addition, the agreement provides that the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible.[6]

5. "Convention on Registration of Objects Launched into Outer Space", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html. Accessed on April 11, 2018.
6. "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html. Accessed on April 11, 2018.

The status of ratification of these treaties is summarised below (Table 1)[7]:

Table 1

Treaty	Entry into Force	Signatory Countries	Countries Ratified
Outer Space Treaty	October 10, 1967	23	107
Rescue Agreement	December 3, 1968	23	96
Liability Convention	September 1, 1972	19	95
Registration Convention, 1975	September 15, 1976	03	67
Moon Agreement, 1979	July 11, 1984	04	18

LEGAL PRINCIPLES

- **The "Declaration of Legal Principles":** This is also called the "Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space", and was adopted vide General Assembly Resolution 1962 (XVIII) of December 13, 1963. These principles stipulate that exploration and use of outer space shall be carried out for the benefit, and in the interests, of all mankind. Outer space and celestial bodies are free for exploration and use by all states on a basis of equality and in accordance with international law. These are not subject to national appropriation by claim of sovereignty, by means of occupation, or by any other means. The activities of states in the exploration and use of outer space shall be carried out in accordance with international law.[8]
- **The "Broadcasting Principles":** This is also called the "Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting", and was adopted vide General Assembly Resolution 37/92 of December 10, 1982. The principle states that every state has an equal right to conduct activities in the field of international direct television broadcasting by satellite and to authorise such activities

7. "Status of International Agreements Relating to Activities in Outer Space as at January 1, 2018", at http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2018_CRP03E.pdf. Accessed on April 11, 2018.
8. "1962 (XVIII). Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space," at http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/legal-principles.html. Accessed on April 12, 2018.

by persons and entities under its jurisdiction. All states and peoples are entitled to, and should, enjoy the benefits from such activities. Access to technology in this field should be available to all states without discrimination, on terms mutually agreed by all concerned.[9]

- **The "Remote Sensing Principles":** Also called the "Principles Relating to Remote Sensing of the Earth from Outer Space", it was adopted in the General Assembly Resolution 41/65 of December 3, 1986. It states that remote sensing activities are to be carried out for the benefit, and in the interests, of all countries, irrespective of their degree of economic, social or scientific and technological development, and taking into particular consideration the needs of the developing countries. States carrying out remote sensing activities are to promote international cooperation in these activities. Remote sensing should promote the protection of the Earth's natural environment and protect mankind from natural disasters.[10]
- **The "Nuclear Power Sources" Principles:** Known as the "The Principles Relevant to the Use of Nuclear Power Sources in Outer Space", this was adopted in the General Assembly Resolution 47/68 of December 14, 1992. It was enacted in order to minimise the quantity of radioactive material in space and the risks involved. In accordance with this principle, the use of nuclear power sources in outer space is to be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way.[11]
- **The "Benefits Declaration":** Known as the "Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit, and in the Interest, of All States, taking into Particular Account the Needs of Developing Countries", it was adopted in the General Assembly Resolution 51/122 of December 13, 1996. It says that states are free to determine all aspects of their participation in international cooperation

9. "37/92. Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting," at http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/dbs-principles.html. Accessed on April 12, 2018.
10. "41/65. Principles Relating to Remote Sensing of the Earth from Outer Space", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/remote-sensing-principles.html. Accessed on April 12, 2018.
11. "47/68. Principles Relevant to the Use of Nuclear Power Sources In Outer Space", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/nps-principles.html. Accessed on April 12, 2018.

While resolutions adopted by the General Assembly are not legally binding, many resolutions dealing with issues related to outer space offer valuable guidance to states on the conduct of space activities.

in the exploration and use of outer space on an equitable and mutually acceptable basis.[12]

GENERAL ASSEMBLY RESOLUTIONS

Every year, the General Assembly adopts a resolution entitled "International Cooperation in the Peaceful Uses of Outer Space". These resolutions lay out the framework for the deliberations in the Committee on the Peaceful Uses of Outer Space and the activities to be undertaken within the Programme on Space Applications of the Office for Outer Space Affairs; 130 resolutions have been adopted till date by the UNGA. While resolutions adopted by the General Assembly are not legally binding, many resolutions dealing with issues related to outer space offer valuable guidance to states on the conduct of space activities. Many provisions of the General Assembly resolutions related to outer space have become widely accepted by the international space community, including the resolution elaborating the concept of the "launching state" (59/115), the resolution endorsing the Space Debris Mitigation Guidelines developed by the Committee on the Peaceful Uses of Outer Space (62/217), the resolution enhancing the practice of states in registering space objects (62/101) and the resolution on recommendations on national space legislation (68/74).[13]

OTHER REGULATORY MECHANISMS

In addition to the implementation of international instruments of space law, states have developed national regulatory frameworks to govern the conduct of space-related activities. States that have enacted national space legislations have taken a number of different approaches in dealing

12. "51/122. Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/space-benefits-declaration.html. Accessed on April 12, 2018.
13. "Space Law: Resolutions", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/resolutions.html. Accessed on April 12, 2018.

with national space activities. National space legislation can be contained in unified acts or a combination of national legal instruments. Furthermore, some states have adapted their national legal frameworks according to the specific needs and practical considerations of the range of space activities conducted and the level of involvement of non-governmental entities. Besides these, there are many bilateral and multilateral international agreements related to activities in outer space.[14]

Today, there are many more space-faring nations, with around 70 countries owning and operating satellites. The governance requirements today are much more diverse and demand a renewed approach to space governance issues.

SHORTFALLS OF EXISTING LEGAL AND REGULATORY FRAMEWORK

As seen from the preceding paragraphs, the existing space legislations belong to an era of a bipolar world space order and cater to the conditions which existed during the Cold War years. Today, there are many more space-faring nations, with around 70 countries owning and operating satellites. The governance requirements today are much more diverse and demand a renewed approach to space governance issues. Negotiations on new treaties like the "Prevention on Placement of Weapons in Outer Space Treaty (PPWT)" and an "International Code of Conduct" as also the UN resolution like "Prevention of Arms Race in Outer Space (PAROS)" have been unsuccessful so far, largely because the leading space-faring nations like the US do not want legally binding instruments for space governance which would curtail their choices for expansion in the space domain. Adding to the dilemma is an increasing number of private players, which has led to commercialisation of space and a proliferation of space capabilities. The dependence on space assets and space applications has become so predominant for space-faring nations that space security has emerged as a priority agenda for these states. The increasing trend towards development

14. "National Space Law", at http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw.html. Accessed on April 12, 2018.

and testing of Anti-Satellite (ASAT) weapons seen in the past decade, is indicative of the ineffectiveness of existing regulatory mechanisms.

The Outer Space Treaty (OST) being the core treaty with a broad international participation of 107 countries to date, needs to be examined to understand the reasons for the state of space militarisation and weaponisation today. A few major observations on the OST and other treaties having a bearing on weaponisation are appended below:

- The OST was negotiated at a time when the two superpowers were the only space-faring nations and the rivalry of the Cold War ensured that neither side got an undue advantage. This adheres to the true spirit of the phrase "space shall be the province of all mankind" as stated in Article I of the OST. Also, Article II prohibits national appropriation by any means, meaning no country can claim any part or the whole of outer space as its own national territory. Many specialists in space law believe that the idea that outer space as a whole is a "province of all mankind" or a "global commons" or what is now popular in international law as the "common heritage of mankind", is a fallacy in interpretation and application of the law, at least within the jurisdiction of the Outer Space Treaty. If we read carefully enough, it is the exploration and use of outer space – the activities – which are the province of all mankind and not outer space – the spatial vacuum – and that all celestial bodies are not the province of all mankind, the human action to explore and use them is. Now when we dissect the misleading interpretation of calling outer space a common heritage of mankind, we are no longer left with the idea that space is owned by all of us equally or as a global commons; instead, what we are left with is that it is owned by nobody. So, on the one hand, now we have countries aspiring to enact laws which assign rights to space-based natural resources and, on the other, we have a spatial status of outer space as something which is incapable of being owned.[15]
- The second most pressing legal challenge in space is really ensuring equitable access to space. With the growing role of private players, space

15. Bayer Goswami, "Legal Challenges in the Evolving Space Order"(paper presented at the course on 'Space in India's Foreign Policy' conducted at NIAS, Begaluru, India, March 19-23, 2018).

is rapidly becoming a competitive domain and market, and with any rapidly growing competitive domain, actions often precede thoughtful regulations and the law lags behind the pace of development. Now Article I, again, also establishes freedom of exploration and use by all states without discrimination of any kind. Scholars have held the view that one state's early access to space cannot be a hindrance to the future interests of non-space-faring nations. Particularly, with the trend of small satellite constellations ranging between 100s to 1000s of satellites in each constellation. Each such constellation could in itself surpass the total number of active satellites which are in orbit around the Earth today. Such rapid progress in space is in sheer contrast with the stagnancy of the regulatory framework in the international space law domain. As an international community, we have not yet been able to form a legally binding international instrument to prevent, and mitigate, the creation of space debris.[16]

- The stagnancy in development of legally binding laws or 'hard laws' is another cause for concern. There is a clear shift in trend, particularly in the space domain, to resort to formation of 'soft laws' such as General Assembly resolutions or recommendations which are not legally binding. At the pace at which the space industry is growing, the need for new laws is only increasing the gap of appropriate laws alarmingly.[17]
- The treaties/agreements/conventions are not universally accepted and are binding only on those states that have ratified them. Even for those states that have ratified the treaties, there is no enforcement mechanism or penal actions for violators other than economic and trade sanctions and political pressure from the UN. Hence, the enforcement of the treaties/agreements/conventions is largely ineffective.
- Article IV of the treaty states that the Moon and other celestial bodies shall be used by all states parties to the treaty exclusively for "peaceful purposes". Though the establishment of military bases and testing of any type of weapon on celestial bodies is forbidden, the interpretation of the

16. Ibid.
17. Ibid.

The UN Charter confers the right of self-defence to a state against hostile action by another state to its space-based assets. This implies that nations can defend their space assets by defensive acts like the use of active and passive anti-ASAT and BMD systems. Tests of all kinds of ASAT and satellite defence systems are, thus, clearly not a violation of the OST.

term "peaceful purposes" could vary. There is no clarity on whether it should mean "exclusively non-military purposes" or "non-aggressive purposes". Dual purpose space technologies and objects are non-aggressive but may serve military purposes. It would be near impossible to achieve an exclusive non-military behaviour of space objects.

- The OST, under Article IV, also prohibits states from placing nuclear weapons or any other Weapon of Mass Destruction (WMD) in the orbit of the Earth. However, the treaty does not prohibit the placement of conventional weapons in orbit. This gives a sort of legitimacy for the use of weapons in space or through the medium of space.
- Article III of the OST states that parties to the treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding. However, Article 51 of the UN Charter also states, "*Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security*"[18]. The UN Charter confers the right of self-defence to a state against hostile action by another state to its space-based assets. This implies that nations can defend their space assets by defensive acts like the use of active and passive anti-ASAT and BMD systems. Tests of all kinds of ASAT and satellite defence systems are, thus, clearly not a violation of the OST.

18. "Charter of the United Nations", Repertory of Practice of UN Organs, at http://legal.un.org/repertory/art51.shtml. Accessed on April 16, 2018.

- Article XI of the OST states, "In order to promote international cooperation in the peaceful exploration and use of outer space, states parties to the treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively". Contrary to Article XI, it has historically been seen that the UN was not informed of any of the ASAT tests and neither was this information shared with the international community. It is, therefore, evident that the Article is neither practical nor feasible.

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- Many terms used in the space treaties like 'outer space', 'weaponisation', 'exploration', and 'exploitation', have not been clearly defined. This gives rise to ambiguity.
- The Registration Convention, under its Article IV states that each state of the registry shall furnish to the secretary-general of the United Nations, as soon as practicable, the information concerning each space object carried on its registry. This information is to specify, besides other details, information on basic orbital parameters, nodal period, inclination, apogee, perigee and general function of the space object. The objective of this convention is to provide transparency and space situational awareness to foster space traffic management, confidence-building measures and for attribution of liability for damage. Though this is a necessity for ensuring controlled access to space, there are no means to ensure adherence to the registration guidelines or adherence to the registered specifications while launching the object. An example is the May 2014 Russian launch of three Kosmos communication satellites (Kosmos 2496, 2497, 2498). An

additional undeclared object was also launched, orbiting a few kilometres away from the declared payloads. It manoeuvred under its own power, eventually making a close approach to the rocket stage that launched it. The object was later identified and catalogued as Kosmos-2499 by the US.

- The Moon Agreement has not been ratified by the major space powers like the US, Russia and China as it seeks to prohibit extra-terrestrial property rights on the Moon and empowers equitable sharing of resources while allowing for mining of resources. With the trend towards commercialisation of space and private players showing interest in space exploration, the terms of the Moon Agreement may not be commercially viable. The US Space Policy Directive-I, issued in late 2017, prioritises exploration of the Moon and deep space in partnership with private players. This will generate much focus and activity on the exploration of the Moon and likely exploitation of rare Earth elements. The Moon Agreement is not robust enough to tackle the evolving situation and may result in military presence on the Moon to regulate the commercial activity.

INSTITUTIONAL FRAMEWORK FOR SPACE GOVERNANCE

The UN General Assembly, in order to consider and deliberate on the various international treaties and agreements, mandated constitution of the "Committee on Peaceful Uses of Outer Space" (COPUOS). COPUOS was set up by the General Assembly in 1959 to govern the exploration and use of space for the benefit of all humanity: for peace, security and development. The committee was tasked with reviewing international cooperation in peaceful uses of outer space, studying space-related activities that could be undertaken by the United Nations, encouraging space research programmes, and studying legal problems arising from the exploration of outer space. The committee was instrumental in the creation of the five treaties and five principles of outer space. International cooperation in space exploration and the use of space technology applications to meet global development goals are discussed in the committee every year. Owing to rapid advances in space technology, the space agenda is constantly evolving. The committee,

therefore, provides a unique platform at the global level to monitor and discuss these developments. The committee has two subsidiary bodies: the Scientific and Technical Subcommittee, and the Legal Subcommittee, both established in 1961. The committee reports to the Fourth Committee of the General Assembly, which adopts an annual resolution on international cooperation in the peaceful uses of outer space. [19]

The "Conference on Disarmament (CD)" was formed in 1979 as the single multilateral disarmament negotiation forum of the international community, after an agreement was reached among member states during the first special session of the UNGA, devoted to disarmament (1978). The CD is the multilateral disarmament negotiating forum of the international community. The CD and its predecessors have negotiated many multilateral arms control, non-proliferation, and disarmament agreements.[20]

While the COPUOS focusses on the technical, legal and commercial aspects of peaceful uses of outer space, the CD addresses issues related to military uses of outer space and the challenges of an impending weaponisation of space. The prime initiative of the CD which aimed to address current gaps in the treaties relevant to space security is the "Prevention of an Arms Race in Outer Space" (PAROS) resolution which was adopted by the United Nations General Assembly's First Committee on Disarmament and International Security. An adhoc committee on PAROS was formed in 1985 to examine and identify issues relevant to PAROS. This committee lasted until 1994. The PAROS resolution was to build on the efforts of the 1967 Outer Space Treaty to preserve space for peaceful uses. It has been a longstanding agenda item in the CD. PAROS lays stress on transparency and confidence-building measures, verification and creation of a legally binding instrument like the "Prevention of Placement of Weapons in Outer Space Treaty (PPWT)" which is currently under negotiation. Even though the US and Israel had repeatedly abstained from voting or voted against a PAROS resolution, the first draft treaty (PPWT) was put up by Russia and China as a joint document on

19. "Committee on the Peaceful Uses of Outer Space", at http://www.unoosa.org/oosa/en/ourwork/copuos/index.html. Accessed on April 17, 2018.
20. "Conference on Disarmament (CD)", at http://www.nti.org/learn/treaties-and-regimes/conference-on-disarmament/. Accessed on April 18, 2018.

The PPWT has not succeeded in receiving large-scale endorsement mainly because the draft treaty does not address direct-ascent ASAT systems; neither does it address soft kill or directed energy weapons like laser weapons or radio frequency interference that could be employed to permanently or temporarily disable a satellite.

February 12, 2008. The second draft was put up by Russia and China on June 10, 2014. The US rejected the second draft due to the lack of a verification regime and provisions that would prohibit the possession, testing, and stockpiling of weapons that could be placed in outer space.

The draft PPWT defines a weapon in outer space as "*any outer space object or component thereof which has been produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth's surface or in its atmosphere, or to eliminate human beings or components of the biosphere which are important to human existence, or to inflict damage on them by using any principles of physics.*"[21]

Also, a device is considered to have been "*placed in outer space*" if "*it orbits the Earth at least once, or follows a section of such an orbit before leaving that orbit, or is permanently located in outer space or on any celestial bodies other than the Earth*".[22]

Ambiguity remains on definitions over where outer space begins, what type of weapons should be prohibited, or the means of verification. The PPWT has not succeeded in receiving large-scale endorsement mainly because the draft treaty does not address direct-ascent ASAT systems; neither does it address soft kill or directed energy weapons like laser weapons or radio frequency interference that could be employed to permanently or temporarily disable a satellite. ASAT systems (hard kill and soft kill) are inherently destabilising and yet do not find a mention in the PPWT.

21. "CD Documents Related to Prevention of an Arms Race in Outer Space", CD1985, June 12, 2004, at https://www.unog.ch/80256EE600585943/(httpPages)/D4C4FE00A7302FB2C12575E4002DED85?OpenDocuOpen, https://documents-dds-ny.un.org/doc/UNDOC/GEN/G14/050/66/PDF/G1405066.pdf?OpenElement. Accessed on April 19, 2018.
22. Ibid.

Also, the issue of space debris is not mentioned anywhere in the proposed draft treaty, even though the issue poses a far bigger challenge than the placement of weapons in outer space. The growth of the space debris population has already affected the safety and functioning of outer space assets. This issue is accentuated by the continued threat posed by the destructive capacity of hard kill, direct-ascent ASATs.

The effectiveness of the UN in dealing with abrogation of UN mandated treaties and resolutions has waned in recent years due to the high-handedness of some advanced space-faring countries. The net result is a failure to protect global public interest.

A large scale commercialisation of space activities has also resulted in the development of new and cutting edge technologies in every field of space to keep the competitive edge. The existing governance mechanisms have not been able to keep pace with these rapid changes. Newer technologies have made existing regulatory mechanisms obsolete. Crowding of the lower Earth orbits due to satellite constellations for the space-based internet is an example. The delay in enacting regulations may also result in a safety hazard for space operations.

In 2006, the General Assembly adopted Resolution 61/75 that calls for concrete proposals for Transparency and Confidence-Building Measures in Outer Space Activities. As an answer to this resolution, the European Union (EU) initiated a process on an International Code of Conduct for Outer Space Activities.

EFFECTIVENESS OF ORGANISATIONS MANDATED BY THE UN IN REGULATING SPACE ACTIVITIES

The United Nations came to the fore in the early years of space ventures by the superpowers, with the formation of the adhoc committee on peaceful uses of outer space on December 13, 1958, and adoption of the first UN Resolution 1348 (XIII) entitled "Question of the Peaceful Use of Outer Space", leading to the formation of the permanent committee of UNCOPUOS on December 12, 1959. When US President John F Kennedy delivered a speech to the UN General Assembly during its 16th session on September 25, 1961,

he said, "*As we extend the rule of law on Earth, so must we also extend it to man's new domain – outer space*." Though treaties and international agreements on the use of outer space were executed in the following years, they were not applied equitably. The US was always in a position of advantage as it had already developed advanced space technologies which could be leveraged to achieve an offensive use of outer space or deny outer space to other developing space nations. Two distinct lobbies have emerged for negotiating a binding legal space treaty, with the US and its allies on one side, and Russia and China on the other, having submitted a joint document for a PPWT. It is rather intriguing that even after a decade of submission of the first draft for the PPWT, no progress is visible in acceptance of the treaty. Besides, there are parallel efforts by the European consortium to formulate an 'International Code of Conduct'. This may be an alternative, but not a remedy to the problem of an impending weaponisation of space.

Formation of UN mandated committees is testimony to the fact that regulation of space activities is necessary. Moreover, the UN is the internationally accepted regulating and mediating body. However, UNGA resolutions being non-binding, contribute majorly to non-adherence and misinterpretation of resolutions and terms of agreements. As issues related to space have become more complex and geopolitics has played a major role in shaping foreign policies, UN resolutions have become ineffective in controlling national security ambitions. The absence of consensus on the Moon Treaty, with countries having active Moon missions not signatories to the agreement being a case in point. The effectiveness of the UN in dealing with abrogation of UN mandated treaties and resolutions has waned in recent years due to the high-handedness of some advanced space-faring countries. The net result is a failure to protect global public interest.

Following the tabling of the second draft of the PPWT in 2014, UNGA again adopted a resolution in 2015 on the "Prevention of an Arms Race in Outer Space" (UNGA Resolution 70/26) and "No First Placement of Weapons in Outer Space" (UNGA Resolution 70/27).[23] Resolution 70/26 was voted

23. UN General Assembly Resolution70/26 and 70/27, at http://www.un.org/en/ga/search/view_doc.asp?symbol=A/70/PV.67. Accessed on April 24, 2018.

with 170 in favour, none against and 2 abstentions (the US and Israel). In contrast, Resolution 70/27 was voted with 129 in favour (including Russia, China and India) 4 against (including the US and Israel) and 46 abstentions. It is interesting to note that among these states, the US, Russia and China are the only space-faring nations with a capability to have a space weapons programme. This is ample evidence of the failure of the UN in evolving a consensus and formulating binding agreements in a multipolar world.

A summary of the limitations of existing major space regulating mechanisms is listed in Table 2 below:

Table 2

Space Regulatory Mechanism	Limitations
Five Core UN Space Treaties	- Very generic. - Scope for varied interpretation. - Undefined terminologies. - Products of the Cold War. - More space-faring countries today. Complex capabilities. Technology curve is well ahead of existing laws. - Limited enforcement mechanisms. - No means of verification - Moon Agreement has very low prescription and very low impact. - Did not cater for democratisation of space access and commercialisation of space industry. - Do not prevent weaponisation of space
UN Declaration of Legal Principles	- Generic in nature. - Cover limited space applications. - Guidelines, not binding. - Did not cater for democratisation of space access and commercialisation of space industry.
UN General Assembly Resolutions	- Resolutions are not legally binding. - Major space powers may abstain. - No means of enforcement.

Negotiations under UNCOPUOS	- Consensual decision-making, implies contentious issues remain unresolved. - Inability to resolve differences in opinion on utilisation of outer space and space weaponisation.

THE MILITARISATION VS WEAPONISATION DEBATE

Space is becoming increasingly vital in the conduct of modern warfare as a force enabler and force enhancer. The use of satellites and space-based applications in the conduct of military affairs has only been increasing ever since this was demonstrated in the Gulf War of 1991 (Operation Desert Storm). Though the use of space has its genesis in the rivalry between the superpowers in the Cold War years, and was intended to ensure a military edge through reconnaissance of nuclear launch sites and communications, the military utility has extended to many other fields like Positioning, Navigation and Timing (PNT) through Global Positioning System (GPS) satellites, weather prediction through weather satellites and use of broadband datalinks through communication satellites for network-centric real-time operations. Military utility of space is, thus, an internationally accepted reality, not barred by existing legal obligations; and militarisation of space is, thus, a beginning but not the end.

While the Outer Space Treaty (OST) of 1967 establishes that space is free for exploration and use by all states, except for the placement of nuclear weapons in space, it implies use of space for peaceful purposes, and utilisation of space as an enabler of military functions does not violate any terms of the treaty. However, the OST is silent on the aspect of placing weapons in space or using weapons from, or through, space. The prospect of using space aggressively was initiated in 1959, with the US testing the world's first ASAT intercept with an air-launched missile, and later in the 1960s, with the Soviet orbital bombardment systems designed to target US nuclear sites. Though there were short periods of pause in ASAT testing due to the Anti-Ballistic Missile (ABM) limitation Treaty of 1972, a brief period of moratorium on testing since 1986 due to the debris issue and post the break-up of the Soviet Union, recent developments suggest a revival and resurgence

of ASAT development specifically in Directed Energy Weapons (DEWs). The emergence of China as a dominant space power, and other countries like the UK, France, Japan, Brazil, India, Israel, Iran and the Koreas as independent space-faring nations is a major contributing factor for the resurgence of the pro-space weaponisation lobby.

Though there is no clearly defined position under the existing legal space regimes on what could be construed as weaponisation of space, a common understanding would include the following acts:

- Placement / orbiting of weapons in outer space.
- Attacking terrestrial objects from weapons based in space.
- Attacking space objects of another state from the Earth or from space.
- Weapons transiting through space (like ballistic missiles or BMD).

The commonly used military applications of space assets, e.g. communications, imagery and navigation are all roles towards enhancement of military capabilities, but have now transitioned from enhancement to being enablers of military power. The recent space activities suggest the beginning of a new era where space is becoming the medium itself for war-fighting and space denial and offensive space force projection is a possibility in the near future.

We all agree that space is currently militarised, but not weaponised. However, the defining line between the two is fading. The dual use conundrum has blurred the lines in a way that allows states to pursue covert agendas on utilisation of space for national security. Directed Energy Weapons (DEWs) like laser systems which have been used as terrestrial-to-space targeting systems are ASAT systems, but their classification as space-weapons is debatable. The commonly used military applications of space assets, e.g. communications, imagery and navigation are all roles towards enhancement of military capabilities, but have now transitioned from enhancement to being enablers of military power. The recent space activities suggest the beginning of a new era where space is becoming the medium itself for war-fighting and space denial and offensive space force projection is a possibility in the near future.

Space commerce and industry have now driven the quest for military superiority into space, such that space weaponisation will now be a fallout of the desire to protect a rapidly expanding space economy.

IS SPACE WEAPONISATION INEVITABLE?

While mutual mistrust amongst the superpowers and Cold War rivalry was the genesis of the first space race, what we see today is a space race for different reasons. Space technology, national space exploration policies, socio-economic dependence on space and commercial interests seem to have pushed the terrestrial limits of military superiority. Space commerce and industry have now driven the quest for military superiority into space, such that space weaponisation will now be a fallout of the desire to protect a rapidly expanding space economy. As space technologies develop further to sustain the quest for space exploitation and burgeoning space commerce, space weapons will find their way into national space policies and doctrines, especially in the absence of clearly defined laws prohibiting space weapons. The pursuit of national interests will compel a space race 2.0, including space dominance through offensive and defensive space capabilities.

Freedom of operation in space has been recognised as the prerequisite for sustaining a space economy as well as for providing unrestricted support to military functions. While space is the dominant medium capable of affecting conventional warfare decisively, emerging ASAT capabilities of opposing space-faring nations could undermine this critical aspect. Space control is, thus, being pursued by the space superpowers as a means of ensuring freedom of operation in space.

Leading space-faring countries like the US, China and Russia are now visibly pursuing active and passive space control technologies. Efforts towards space-based BMD and DEWs are drivers of space weaponisation. The US National Security Strategy clearly prioritises defence of its space assets and freedom of operation in space. Space capabilities also figure as a strategic domain where the US seeks to renew capabilities and a competitive advantage. This is a significant shift from the US national space policy of 2010, which talks about strengthening stability in space by promoting its peaceful use. The US

National Defence Strategy of 2018 in contrast has put countering China and Russia at the core of America's new priorities, listing China and Russia as paramount security threats to the US. These developments are indicators of a greater power competition, shifting the focus from terrorism. China's space adventurism in the past decade, and its growing space clout which is visible in its reaching the third slot in the world space order is an indicator of the reason for China being designated as a strategic competitor by the US. It is not surprising that China and Russia, along with the US, are the only countries to have tested ASATs and are actively pursuing ASAT technologies. Other space-faring countries like Iran and North Korea may not be far behind.

Orbital debris and lack of credible debris mitigation techniques is probably the single most prevailing reason for preventing space weaponisation. The single largest source of debris has been through intentional satellite explosions through ASATs and accidental collisions in space.

As a counter-view, space has enabled global visibility in terms of communications and intelligence gathering. This has given the possibility of everyone watching everyone. The transparency can be said to be nurturing global stability. Weaponisation of space creates global instability, there being no limits to the extent of space weaponisation and no means of assessment either. This is bound to give rise to space posturing and is likely to result in escalation and preemption. Also, the lucrative prospect of orchestrating wars through and in space may make conventional militaries ineffective, or worse still, push them back to the archaic role of occupying forces.

Orbital debris and lack of credible debris mitigation techniques is probably the single most prevailing reason for preventing space weaponisation. The single largest source of debris has been through intentional satellite explosions through ASATs and accidental collisions in space. There is a growing concern in the international space community due to the increasing number of operational space systems and a limited space situational awareness capability which may result in accidental collisions and chain reactions of exponentially increasing orbital debris. A space regulation prohibiting launch of space objects without

reliable debris mitigation procedures is an option which could prevent further escalation of debris.

The real problem lies in the absence of any UN mandated treaty which clearly defines unacceptable weaponisation of space and institutes clauses for prevention and verification. The biggest roadblock to any stringent international treaty bringing more transparency and weapons control to outer space is the US. The US would not want a space weapons control treaty as it would limit its National Missile Defence (NMD) architecture and undermine its hegemony in space control technologies. Nations with existing space weaponisation programmes need to first take the lead in decommissioning existing offensive space Research and Development (R&D) through mutual consent, which is a distant possibility. Expansion of the OST to prohibit offensive use of space and strengthening existing legislations through an internationally acceptable treaty is being deliberated upon since 2008. However, unless the top three space-faring nations take a step back, weaponisation of space may be a reality.

Are space weapons inevitable? Human nature, national ambitions and geopolitics seem to push us towards them. Every medium – land, sea and air – has seen conflict. There is no reason why space should be any different. The quest for military supremacy in all the dimensions of warfare, unrestricted access to space-based assets, the desire to pioneer space exploitation and a viable deterrence value created through space are all pointers towards an impending weaponisation of space. [24]

CAN SPACE WEAPONS WIN WARS?

This is probably the only reason why a nation should even think of possessing space weapons. As mentioned earlier, space weapons (non-nuclear) could be of many types, depending on where the intended target is located, i.e. on the ground, in space or in between. Also, these weapons could be terrestrially located or in space. Weapons in space for targeting space objects or terrestrial targets are still a fictional concept. Though the Soviet Orbital Bombardment

24. T H Anand Rao, "Is Space Weaponisation Inevitable?", CAPS Expertview, February 5, 2018, at http://capsindia.org/expertview. Accessed on April 30, 2018.

Systems of the 1960s were intended to destroy targets on the Earth, these are yet to evolve and have not been tested. Present capabilities possessed by the US, Russia and China are limited to ASATs launched from the Earth, DEWs and co-orbital or parasite ASAT platforms. The cost of developing such weapons and maintaining them in a reliable state is also exorbitantly high.

Space systems are mostly dependent on satellites for various applications. This has already been brought out earlier. These include the military functions. With today's military functioning becoming gradually reliant on information dominance which is enabled by the networked Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) architecture, a disruption of satellite services could, at best, delay, disrupt or temporarily deny a service like recce reports, navigation and positioning service or data transfer. These disruptions or denial of services would be temporary as redundancy exists through terrestrial systems or other satellites of a constellation. Thus, if a satellite is destroyed or disabled as a consequence of military conflict, it could, at best, be compared to losing an aircraft or a tank in battle. The capability to launch satellites on demand, orbit large constellations of small satellites for various military and civilian applications, and have backup systems on the ground would ensure that the occasional ASAT could be ignored or responded to.

Present military space capabilities are limited to enhancing and enabling the performance of a military on the ground. In no way, would the loss of some space assets be decisive in any conflict, even though it is considered a Centre of Gravity (CoG). But it could definitely influence the outcome of the war depending on the degree of dependence on space assets for war-fighting. Weapons having effects on a larger scale like nuclear detonations in space could change the scenario.

THE DUAL USE DILEMMA

It is a known fact that space technology is a dual use technology. Many military missions and objects in space can be concealed as activities towards scientific research and for peaceful uses. For instance, the US X-37B space plane which is an unmanned autonomous space vehicle, has done five long duration

In the international space community, it is generally agreed that the laws applicable to armed conflict extend to activities in outer space. Therefore, attacking an opponent nation's known military assets in space would not pose a major issue during a conflict.

missions in space and is suspected to have capabilities in counter-space activities, though it is launched for space exploration missions. Similarly, other space objects like satellites are launched for civilian applications like remote sensing or specific military applications like reconnaissance. There being no pre-launch verification of payloads in the existing space governance mechanism, means that the task performed by the satellite or space object cannot be ascertained, which could then possibly be a co-orbital ASAT or a satellite with potential to become an explosive or an EMP generating object. The possibilities are diverse and none can be ruled out. This makes the space domain a potentially unstable environment which could be used to advantage by space capable nations to gain advantage in an armed conflict.

While the 'UN Charter' upholds the right to self-defence if a nation's sovereignty is undermined – and this extends to security of objects in space – there is a lack of clarity on the applicability of the "Laws of Armed Conflict". Attacks on legitimate military objectives versus civilian objects are well regulated in the context of armed conflict (Additional Protocol I, Article 52). In the international space community, it is generally agreed that the laws applicable to armed conflict extend to activities in outer space. Therefore, attacking an opponent nation's known military assets in space would not pose a major issue during a conflict. However, if the space object or objectives of space activities are clearly defined as being for civilian use despite being dual use technologies, then an attack on such objects could be a violation of the laws of armed conflict. Also, the impact of destroying or disabling a satellite used for critical functions like positioning (GPS) or communication (banking systems) could be disastrous.

EMERGING CONCERNS

- **Vulnerability of Space Assets:** A satellite has an average life of 10-15 years depending on the orbit type, size and fuel capacity. This means,

many satellites have been in orbit for more than 10 years or were launched before the ASAT race kicked in following the 2007 test by China. Satellites of this vintage may not have the basic protection like hardening and shielding against ASAT weapons like directed energy weapons or against minute debris particles (< 1cm). In the current trend of commercialisation of space applications and miniaturisation of satellites, the satellite vulnerabilities are not addressed by private satellite launchers to achieve reduction in capital costs. Also, private satellite companies like 'one web' are planning to launch constellations of large numbers of small satellites in Low Earth Orbit (LEO) for cost-effective solutions in communication and satellite-based internet services. These satellites would be easy targets in LEO for any ASAT misadventure by a hostile state, and will also be prone to disruption of services caused by electronic interference or electromagnetic pulse events.

The intentional or unintentional targeting of space assets would cause temporary or permanent disruption of satellite services, some of which could be critical for a state's well-being or economy, e.g. banking and communication applications. There would always be a chance of escalation of tensions depending on the underlying fault lines in bilateral relations.

- **Fear of Escalation:** The intentional or unintentional targeting of space assets would cause temporary or permanent disruption of satellite services, some of which could be critical for a state's well-being or economy, e.g. banking and communication applications. There would always be a chance of escalation of tensions depending on the underlying fault lines in bilateral relations. Escalation into a military conflict will always be a chance occurrence if diplomatic measures to resolve the conflict fail.
- **Uncontrolled Debris:** Outer space today is congested not only due to the increasing numbers of satellites but also due to space debris. Around 19,157 objects larger than 10 cm are being tracked by the US Space Surveillance Network. Only about 1,800 of these objects are operational

spacecraft or satellites; the rest comprise orbital debris. The estimated population of particles between 1 to 10 cm in diameter is approximately 5,00,000. The number of particles smaller than 1 cm probably exceeds a million and can only be speculated. Most orbital debris is within 2,000 km of the Earth's surface. Within this volume, the amount of debris varies significantly with altitude. The greatest concentrations of debris are found near 800-850 km.[25] Three unnerving facts merit consideration here: (a) only debris more than 10 cm in size can be tracked reliably with the present capabilities, and particles > 5cm can be located; (b) debris will remain in outer space forever, unless technologies to remove them are fully developed; (c) any destructive event in space like an explosion due to a collision, impact or ASAT activity is going to create more debris.

The debris created by a single destructive event will increase exponentially with a cascading effect (as described by 'Kessler's Syndrome') and would permanently degrade the space environment. It may be recalled that the Chinese ASAT test of 2007 created 3,000 pieces of trackable debris. Weaponisation of space would make the debris problem much worse, and even one war in space could engulf the entire planet in a debris cloud, making outer space practically unusable for any space applications.

- **Proliferation of Soft Kill ASAT Weapons:** The evolution of ASAT weapons started with hard kill ASAT weapons like kinetic kill vehicles, which could be mounted on a ballistic missile platform. The convenience of converting an already available platform (for states that possessed ballistic missile and BMD technology) meant that any space-faring nation with launch capability could develop an ASAT programme. Access to missile and space technology by many developing countries like Iran and North Korea has increased the possibility of ASAT proliferation. However, these hard kill ASATs invite international condemnation and sanctions which need to be avoided. Moreover, the past decade has seen an awakening regarding space debris avoidance and mitigation. This change was triggered by the Chinese ASAT test of 2007. The emerging situation has

25. "Space Debris", at https://nasasearch.nasa.gov/search?query=debris&affiliate=nasa&utf8=%E2%9C%93. Accessed on April 30, 2018.

resulted in the development of soft kill ASAT technologies like Directed Energy Weapons (DEWs), Electromagnetic Pulse (EMP) weapons, Radio Frequency Interference (RFI) and cyber attacks on space infrastructure. The effects could be temporary or permanent disability. While the cost of developing soft kill weapons is much lower, the source of soft kill attacks is difficult to trace and the cause of malfunction or damage may also not be pinpointed by the victim state. Owing to these reasons, a global shift towards soft kill weapons has been seen in recent years. The US, China and Russia are known to possess proven capabilities in laser weapons and RFI. While the advantages of developing soft kill weapons are understandable, the emerging situation of space weaponisation is that of uncertainty. Soft kill weapons would not fall under the ambit of the classical definition of space weapons, while still retaining the effect that would be caused by space weapons. This would create an imbalance in global and regional stability as there is always fear of the unknown in any geopolitically tense situation. Whether such soft kill weapons would lead to an escalation to military response or not is a matter of debate, as it would mainly depend on identification of the hostile action.

- **Impediment to Growth of Space Economy:** The space economy in terms of growth rate has shown a higher growth as compared to the Gross Domestic Product (GDP) growth rate of major economies. This was possible because of a surge in innovative satellite applications, growth in the satellite manufacturing and space launch segment, and emergence of the small satellite market. Above all, it is the commercialisation of the space industry which drives the space economy. All this was possible in the belief that space was a sanctuary and treated as a 'global commons'. With the change of the status quo in outer space and a shift from the 'sanctuary' to the 'control' school of thought amongst the leading space-faring nations, space commerce would definitely be a casualty in such an atmosphere of uncertainty.
- **Mistaken Military Response**

  Many events in space are unpredictable. These could be natural like cosmic events or situations arising out of technical glitches or unintentional collisions. Flashes by meteors or cosmic explosions

Unintentional explosions, uncontrolled behaviour, and unintentional collisions of man-made space objects have the potential to create hostile situations, if the event is perceived as a deliberate act of war. Such a situation is aggravated in a pre-condition of geopolitical instability and an existing hostile environment.

could be mistaken for a missile attack though such a possibility is extremely rare. Unintentional explosions, uncontrolled behaviour, and unintentional collisions of man-made space objects have the potential to create hostile situations, if the event is perceived as a deliberate act of war. Such a situation is aggravated in a pre-condition of geopolitical instability and an existing hostile environment. Prevention of a mistaken military response is only possible through the creation of well-defined laws and regulations, and sharing of information and transparency in space activity.

TRIGGER EVENTS

The realisation among space-faring nations to be capable of identifying threats from space and possess space capabilities that can withstand aggressive counter-space programmes is the start point to developing counter-space capabilities. The capabilities envisaged would differ depending on the threat scenario. The US perceives Russia, China and North Korea as a threat to global peace. The converse is also true. But when it comes to space capabilities the asymmetry narrows down to irrelevance mainly owing to the fact that DEWs like laser weapons can cause disruptions in satellite services. The result is an upward spiral in development of offensive and defensive space capabilities by these countries. There have been some trigger events in the space domain which have raised the bar of mistrust after the Cold War era and collapse of the Soviet Union:

- Chinese ASAT test in 2007.
- US ASAT test in 2008.
- US refusal to accept terms of draft PPWT put up by China and Russia in 2008 and 2014.

- US and Israel abstaining from a vote on UNGA Resolution 70/26 and voting against Resolution 70/27, in 2015.
- Active development and testing of satellite rendezvous technology for undertaking repairs and /or debris removal technologies by the US, Russia and China. These being dual use technologies, they could possibly also have counter-space capabilities.
- Active development and testing of DEWs like laser weapons by the US, Russia and China.
- Development of electronic interference capability against satellite links.
- Long duration missions of the X-37B spaceplane with an undisclosed mission profile.
- Global trend towards large constellations of small satellites, and swarm satellites, raising fears of violating a nation's sovereignty, intensifying the problem of space traffic management, and making covert missions more difficult to detect.

It is reasonable to assume that individual space ambitions can be fulfilled by sharing of the resources. A shift towards sharing of space resources and collaborative efforts will have the advantage of lowering the threat value of a space asset. Targeting of each other's space assets in a situation of military conflict will then become a remote possibility.

COLLABORATION: AN ANTIDOTE FOR WEAPONISATION OF SPACE?

Space projects like the Apollo Moon missions which were undertaken by the US entirely on its own, demand highly competitive and skilled effort and budgetary allocations, all of which are a drain on the economy. In today's scenario, the high costs of space activity and rapidly progressing space technology, i.e. reusable launch vehicles, ion propulsion, optical communication, etc. may require the coordinated effort of many nations. Cooperation, alliances, partnerships and an inclusive approach are finding more relevance in the present global space scenario for various reasons. International cooperation in many technologies, and specifically those which have a major bearing on social well-being, is more of a necessity, even for the developed nations. Such cooperative approaches are

already being seen with the International Space Station (ISS) becoming truly an international effort. Inclusion of China also in the ISS programme would be a boon for China as well as the ISS programme, and, at the same time, assist in building trust and understanding of each other's capabilities. The European Space Agency (ESA) is a shining example of a conglomerate of space capable nations jointly working towards passing on the benefits of space to their citizens and conducting some pioneering work on space exploration, even though they have the capability and capacity to jointly develop counter-space technologies. The South Asia satellite or South Asian Association for Regional Cooperation (SAARC) satellite launched by the Indian Space Research Organisation (ISRO) in 2017, for meeting the communication needs of the South Asian countries is another example of regional cooperation in space ventures. With spectrum and orbital crowding emerging as a critical concern, especially in Low Earth Orbit (LEO) and Geosynchronous Earth Orbit (GEO), it is evident that not every entity in space can get a slot of choice. It is reasonable to assume that individual space ambitions can be fulfilled by sharing of the resources. A shift towards sharing of space resources and collaborative efforts will have the advantage of lowering the threat value of a space asset. Targeting of each other's space assets in a situation of military conflict will then become a remote possibility as it would affect many nations. Such multilateral collaborations with more participating countries will also foster preserving space as a sanctuary for peaceful uses only. The trend towards offensive actions in space would then see a reversal.

NEED FOR A PROACTIVE APPROACH

While advances in space technologies over the past few decades have given a new dimension to accelerated living and space commerce, outer space has not only become a new dimension of warfare but also a critical domain for information dominance and an inseparable part of the national security calculus. The C4ISR environment created by the "Revolution in Military Affairs (RMA)", based on network-centric operations and an integration of Information and Communication Technologies (ICT) is increasingly dependent on space capabilities. This fact has been recognised by many

countries and has resulted in a realisation of the essence of offensive and defensive space control for having freedom of operation in space. This opportunity to create asymmetry through the domain of space, along with ease of access to some countries, has had an impact on the international balance of power equation, which has emerged as a new dimension in global stability.

The OST of 1967 did prohibit placing of weapons of mass destruction in orbit, which was the need of the times. It was not foreseen that weaponisation of space through conventional and soft kill weapons would some day become a reality. This loophole in the OST is being viewed as a right to develop and possess weapons which could have an effect in outer space. The emergence of new space powers like China, India, Japan and North Korea and the relative ease with which ASATs can now be developed on an anti-ballistic missile framework are pointers to outer space becoming contested. In future, more nations would aspire to possess space weapons to achieve space security. The deterrence value of offensive space capabilities can lure many countries to developing space weapons. In turn, the advanced space-faring nations would push the bar a little further by upgrading the technology and having export controls to retain their supremacy. This would trigger an inherent space race to gain control of space, and is a vicious cycle. This impending gridlock needs to be prevented, with immediate steps to reassure the international community that outer space cannot become a battleground. Some of the steps that need to be initiated on a war-footing are:

- Urgently revamp the treaties, agreements and laws concerning space governance with binding international laws.
- Define the terms 'space weapons', 'peaceful use of outer space', 'offensive use of outer space'.
- Spell out the threshold of military uses of space.
- Immediately effect a ban on testing of destructive space technology like ASATs, DEWs and EMP weapons. Since these could be veiled in dual use technologies, a ban could be based on 'intent' and 'profile' of testing, rather than a ban on technology proving.

- Lay down a limiting altitude for BMD weapons, say, 200 km, to prevent interception explosions in LEO, which would create space debris. The interception altitude should cater for orbital decay and burnout of debris created due to explosion.
- Lay down an internationally accepted code of conduct for utilisation of space.
- Form an unbiased agency under the UN, with representation from all space-faring nations, with a well defined mandate, like that given to the International Atomic Energy Agency (IAEA), to inspect all space facilities across the world, and make recommendations to be implemented by the UN.
- Promote transparency in space operations and sharing of information.
- All space missions should be conducted through international cooperation with no single stakeholder.
- All Space Situational Awareness (SSA) inputs from across the world should be fed into a single global network and administered jointly through international cooperation.
- Benefits accruing through space missions can be made accessible to all nations.
- Pioneering nations can get compensated through other mechanisms, like priority allotment of orbital slots, waiver of loans from the World Bank, access to free trade, airports and sea ports, easing of immigration rules, etc.

For all this to take a positive turn, a great deal of visibility in space activities is essential. Launch of unregistered space objects covertly or on a rideshare arrangement has been witnessed in the past. Such events can be avoided only if the space situational awareness network is made an internationally monitored network. Presently, it is a network with a US monopoly, as a majority of sensors belong to the US. For such globalisation, the SSA capabilities must be distributed across the world with technology sharing agreements and international funding of projects.