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# LEGAL DIMENSIONS OF COMMERCIALISATION OF SPACE



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# Legal Dimensions of Commercialisation of Space

*(The following is a transcript of the presentation made by Dr Ranjana Kaul at the Vivekananda International Foundation during a joint roundtable with Indian Space Foundation on 18 January 2023)*

The world is moving towards contestation of the 'Outer Space' wherein efforts are shifting from exploration to 'commercialization'. There are increasing efforts and investments by major space powers to develop cutting edge disruptive capabilities. At the same time, several new nations are showing increased interest in adopting space technology at a scale, not seen before. **Technological maturity, miniaturization; easy affordability and accessibility to high end technology; as well as quest for a connected digital space have emerged as the prime driving force for commercialization of space.** Hence, as the building blocks of a space based digital ecosystem are laid, we examine the legal and policy dimensions of space and its impact on Indian national interest from a commercial as well as strategic perspective.

## Overview

The subject *Commercialization of Outer Space* is a very challenging and difficult topic. The reason is that, as much as it is about all the conversations,

we have been having for the last two years plus – about commercialization of space, its potential and what we should do or should not do, the fact of the matter is that we have actually been applying our minds with one hand tied behind our backs. Why do I say that? Because the international treaty regime that governs outer space was designed for and remains an ecosystem for the continued military use of outer space. And, therefore, what we have been trying to do, up until now, is to pick that very small *regulatory* window which happens to exist within the outer space treaty and to fit the entire framework for commercial space activities into it, without actually even understanding its place, function and context within the whole outer space treaty framework.

The good news, fortunately, is that India has finally stepped out and openly stated that it is interested in the military use of outer space. That makes it much simpler talking about it, and, easier for you to understand the references in context to the requirements, the challenges of what a commercial space operator shall be confronted. It cannot, therefore, any longer be a matter for adopting a skimming the surface approach to policy and national law related to commercialization of space. Therefore, I am going to take the liberty to take you through a reference to context type of narrative. I will explain the context in which the Outer Space Treaty was framed by the two military powers, and reference that down to its aspects related to the commercialization of outer space.

## **The Context**

For most of us the starting point for Outer Space is *Sputnik*. For others it may be Elon Musk, and, for good reason too. But, in fact, as we know, it all started fifteen years before Sputnik happened. That was when the V-2 rockets designed by Nazi scientists were deployed to bombard Western Europe. The thing is that V-2 took the allied commanders by complete

surprise, especially since they were quite confident of their victory. It's fair to say that they were at their wits end because never had a machine such as this been seen on the battlefield before. What V-2 was doing is that it was firing 1 ton of explosive travelling over a trajectory of 300 km to hit its intended target. The important point of the V-2 was not as much that there were 3000 of them used against the allies –but the important point was that the nose of the V-2 had sensors which were able to sense- pick up- radio frequencies from the ground and thus zero in precisely to the location of intended hit. This was something against which the tanks and other armaments were helpless. The allied commanders were completely at a loss. The V-2 bombardments went on through 1942–1943. The point is that afterwards, then the allies did altitudinal computations, it seems that the early 1942 V2 version had achieved an altitude of about 89 kilometers and by 1943 the V-2 was achieving an altitude of 144 km. For the allies, it seemed as if all was slipping away on both the eastern and western fronts – until the battle of *Stalingrad* happened, a battle that waged on for more than six months. The whole aim of the exercise for Germany was to get a hold of Stalingrad, located on the Volga- which was a strategic location for the Soviets. It is an industrial town. It is the gateway to the oil fields beyond the Caucasus, and the Volga takes you to the Black Sea. Finally, as it happened Marshall Zukov, the Soviet Defence Minister, launched a two-pronged attack to girdle the Nazi 3<sup>rd</sup> Army and 4<sup>th</sup> Panzer division. The Romanian and Hungarian army divisions assigned to defend the German flanks crumbled. The Soviets cut- off the re-supply routes, with orders to his army to fight to the last man and last round, Hitler was forced to airdrop supplies, and, to finally withdraw troops from the western front for re-deployment to Stalingrad. This was the decisive development in February 1943 led by the Soviets which turned the narrative in favour of the allies.

That in turn led to two important outcomes. (1) First, that by mid-1944, the allies – particularly the US found that the hundreds of aircrafts manufactured for the war were now idling on tarmacs in the US. European allies had same experience. Something had to be done; (2) the determination of the US and USSR to get a hold of everything related to the V2 missiles technology, its drawings, hardware, scientists and anything connected to it.

## **The Outcomes of WWII**

But first things first. Well before the war ended in 1945, the about to be victorious allies met in Chicago in December 1944. They decided that the way forward for the idling aircrafts was to harness them for use in providing international civil air transportation on commercial basis. They crafted the Chicago Convention on the Unification of Rules Governing Civil Aviation which was signed on 7<sup>th</sup> December 1944. The Chicago Convention established the International Civil Aviation Organization which is located in Montreal (Canada being the host country). India is represented on the ICAO Council. The international air travel which has a ubiquitous presence in our lives is the first outcome of WW II.

## **The Space Age**

The challenges for the commercialization of space are best understood in context to regulatory frameworks of outer space treaties set up by the two military powers.

By mid-1944 with victory imminent, the superpower agendas were focussed on the acquisition of the scientists, designs, drawings, and hardware, everything that made V2 possible. When Americans reached Peneemunde they found scores of scientists who had been involved in the V2 project. The US mounted *Operation Paperclip*- a programme under

which 116 Nazi scientists were provided new identities and taken to the US. Their prize was Dr. Werner *von* Braun who had conceived, designed and realized the V-2. It is to him that the US owes a huge debt of gratitude for the success of its amazing space programme. *Von* Braun was appointed Director, Marshall Space Flight Centre, NASA. He designed the world's first ICBM 'Atlas A' and the Saturn V rocket which took Neil Armstrong, Buzz Aldrin and Michael Collins to the Moon in July 1969. The US is the only country which has planted its national flag on the Moon. In 1975 Von Braun was awarded the US National Medal for Science.

Stalin had also taken note of the V-2. What he did was to appoint Dr. Sergei Korolev a rocket scientist to head the mission. Now, Korolev was a Ukrainian schooled in Kyiv and in technical school in Odessa. Obsessed with aerospace, space travel and such like, he had built a model rockets. Korolev had been equally enthusiastic in denouncing Stalin's secret police, which was the instrument of choice for repressing political opponents. For his effort, Korolev and his friends were shipped off to a gulag and put to forced labour. But destiny intervened. He was summoned. Now brushed and dusted he presented himself and found himself appointed head of the rocket programme with instructions from Stalin to get the job done. And so he did. There is a photograph of Sergei Korolev with Yuri Gagarin, the first man to go into space in 1961. Some may remember that Gagarin visited Delhi in November 1961.

On 4<sup>th</sup> October 1957, the Soviets launched world's first military communications satellite *Sputnik* - demonstrating indigenous capability and technologies for building and launching orbit class rocket and satellite, satellite communication capability, building and operating Earth Station (command, control, telemetry), harness and use Spectrum RF for secure communications and to receive the communication signals. In short, the Soviets had the full stack.



*Sputnik* had triggered an enormous revolution in military affairs. Outer Space was the new military “high ground”. This, understandably, made the US very nervous. We will remember that it is in this context that President Kennedy speaking at the Rice University declared that the US would land the first man on the Moon.

## The Space Treaties

The question was *Who Will Own Space?*

Neither military power was inclined to another confrontation. Nor did bilateral or multilateral agreements did find favour given their inherent fickle basis wherein a party could walk out without warning. Outer space was the new *military high ground*. Expediency dictated that the best way to ensure continued unhindered freedom to use of outer space for to develop capability and capacity in military space technology, without threat or actual aggression on land territories, to prevent the other from extending sovereignty in space, the way forward was to undertake discussions and negotiations to the newly established United Nations Organization.

## Outer Space & the UN

Within weeks of *Sputnik* in October 1957, in November 1957, USA and USSR agreed that *Outer Space included the Moon and celestial bodies*, (in short our solar system); in terms of UNGA Resolution 1148 (XII) dated 14<sup>th</sup> October 1957 it was agreed that *activities for the exploration and use of outer space, including the Moon and celestial bodies would be undertaken for peaceful purpose*.

Now, the term *peaceful purpose* sounds rather benign. It isn't. The agreed, negotiated interpretation of *for peaceful purpose* was *for non-aggressive purpose*. Within weeks of the UNGA Resolution, on 17<sup>th</sup> December 1957,

the US launched the world's first ICBM. This event was not construed by USSR as being aggressive or against it. The stage for military use of outer space was thus set.

In addition, undoubtedly with great forethought, activities in outer space were made subject to international law, including the UN Charter. This was important. The UN Charter Article 2(4) protection ensured that neither would be subject to threats of terrestrial aggression, and, should such event happen, UN Charter Article 61 ensured that each retained the right of self- defence.

1957-1979 was a period for the development of military space technology and capabilities, and the period when simultaneous new corpus in international law – that is the *international treaty law on space* was developed at the UN.

## **COPOUS & OOSA**

Two new institutional mechanisms dedicated to outer space were established at the UN. In 1958 the *Committee on Peaceful Uses of Outer Space* (COPOUS) was established as a permanent committee of the UNGA. The COPOUS has two sub-committees (i) Scientific & Technical Sub Committee; and (ii) Legal Sub Committee. Then, in 1959 with the *Office of Outer Space Affairs* (OOSA) to act as the COPOUS secretariate. The COPOUS and OOSA are located in Vienna. The outcome was the five international space law treaties.

## **Limited Test Ban Treaty 1963**

Having said that, although not counted as a space law treaty, the Limited (Partial) Test Ban Treaty, 1963 is significant in respect of outer space in context to the prohibition of nuclear tests in outer space. This is reflected

in Article IV, Outer Space Treaty, which prohibits testing of nuclear and WMDs and the placement of nuclear and WMD weapon systems anywhere in outer space, including on the Moon and celestial bodies.

As we know, the world entered the nuclear age consequent the atomic bomb strikes in Hiroshima and Nagasaki in 1945. The USA and USSR undertook scores of nuclear and thermonuclear tests in outer space and under water. Having achieved capability in all domains, the Limited Test Ban Treaty 1963 was established prohibiting tests in outer space, atmosphere and underwater. Underground nuclear tests were excluded from its ambit.

Finally the 1968 UN resolution permitting the peaceful use of nuclear technology, opened the gateway for developing nuclear energy and the use of nuclear fuel in rockets and satellites and so forth. In context to liability in outer space, the 1992 UNGA a resolution on the *principle on use of nuclear energy sources in outer space* linked *liability* to the *launching state* for damage caused by the nuclear power source used in space objects.

## **Rendezvous and Proximity Operations (RPO) – New Developments**

The development of RPO has been developed and being developed by several space faring powers. As with other space technologies, RPO could also be tasked for dual purpose - including active debris removal, inspection at close range, on orbit servicing, manufacturing and assembly, which could be peaceful or may be perceived to be a threat.

In the recent past, the US had expressed concern over perceived threat from close proximity manoeuvres of a spacecraft with robotic arms near its space asset. With RPO there is possibility of jamming, laser or other method to make a satellite inactive. Essentially resulting in one piece of debris,

instead of several hundred caused by a DA – ASAT. These activities have a tectonic dimension and raise questions about liability and responsibility in outer space.

## **Where is Outer Space?**

*Where is Outer Space?* Notwithstanding hectic developments, this obvious and seminal question remains unanswered.

The Outer Space Treaty does not provide a written definition nor indicates the precise altitude above which lies *outer space*, nor does such a rule exist in international law, although it is accepted internationally, including by the UN agencies, that outer space lies 100 km above the Earth's surface, and that this notional boundary is called *Kamran Line*. And, all nations accept that state sovereignty is prohibited in outer space claims through national appropriation, occupation, use or in any other way, as is stated in Article II of the outer space treaty.

In fact, the same is true for air space. The Chicago Convention does not provide a written definition nor indicates the precise vertical extent of sovereign air space, nor does such a rule exist in international law. But all nations exercise sovereign jurisdiction within their air space (above the country's territory and territorial waters) because Article I of the Chicago Convention states as much. The country's national civil air transportation and the air force operate under regulations based on the sovereign jurisdiction over airspace which is stated in the Chicago Convention 1944.

In other words, the prescription of prohibition of state sovereignty in outer space is exactly opposite of exclusive state sovereignty in air space.

So where did this *Kamran Line* come from? Theodore Kamran the Hungarian American mathematician who was the first to attempt measuring the altitude of atmosphere. And, it all started in the 1960s

when the International Federation of Aeronautic Sports, Strasbourg used the term *Kamran Line* which it pitched at 100km, as a convenient way of distinguishing an upper altitude for aero-sports from activities undertaken above 100 km.

Therefore, as much as the *Kamran Line* represents a notional threshold into outer space, by implication, it also represents the notional vertical altitude of sovereign air space.

## **Aerospace- New Developments**

Let's fast forward to our own times. Consequent to the 5G Wireless Communications revolution, the use of 5G is permitted for *space transportation – sub-orbital and orbital flights*. This is the big next commercial activity in air/outer space that is about to happen-including space tourism. Think of Richard Branson and Jeff Bezos- who successfully demonstrated in 2021, the commercial potential of sub-orbital flights. Aerospace vehicles are unique. An aerospace vehicle takes off like aircrafts from spaceports on the Earth - surge upwards like rockets into outer space across the so-called Kamran Line- and then return the Earth landing back like an aircraft. It is important to keep in mind that, quite apart from the special technologies that are deployed in aerospace vehicles, the use of aerospace vehicle presents a regulatory conundrums, since as is obvious, an aerospace vehicle will fly through sovereign airspace (governed under Chicago Convention), then into outer space (governed by Outer Space Treaty which prohibits application of sovereignty), and back through sovereign airspace to land on the Earth. It is obvious that the development of space transportation-orbital and suborbital- will have a significant impact on the international air law and international space law treaty regimes. In short, airspace and outer space are now on the cusp of convergence.

Indeed, the longest time our Airforce has referred to itself as the *aerospace force*. Now, *aerospace* is, in fact, upon you. How are we going to deal with it? I recall a conversation with Ajey Lele years ago, when we were doing something at IDSA on the International Code of Conduct 2010 and EU Code of Conduct 2008, following the Chinese ASAT 2007. I asked him - why was it that we must only always 'react' when something happens elsewhere. That's when we get together feverishly trying to figure it out - perhaps write a paper? Well, now you have advance information. I am providing it to you. I am convinced that if we want to achieve commercialization, then we have to be up to speed with what is happening around us in this domain. We ought to have an institutional vertical which will deal with new developments - not just technology but also be up to speed with developments in the international regulatory domain.

The question of *definition and delimitation of outer space* remains a pending agenda item in COPOUS; presently, there is no consensus on the subject. The existing absence of precise definition and delimitation of outer space (and air space) has not yet created regulatory challenges. However, this critical *definitional gap* may create regulatory challenges in context to the prospects of *aerospace activities* involving space transportation.

Presently, space activities are mainly focussed in Earth orbit. Among new activities are establishment of mega constellations in Low Earth Orbit (LEO) for providing satellite broadband services. The rapid congestion is well recorded.

## **International Space Treaties**

As I said, that the period after 1945 was a hectic in context to the race to develop the full spectrum of military space capability. For example, already in addition to the 1957 Sputnik and ICBM, the first man was sent into outer space -Yuri Gagarin in 1961, and the first woman Valentina

Treshkova in 1963. In September 1962 President Kennedy addressing the Rice University declared “*we choose to go to the Moon*” regarding his proposal to land a man on the Moon before 1970. Neil Armstrong, ‘Buzz’ Aldrin and Michael Collins landed on the Moon in July 1969. In short, the space race was on.

The development of military capability through 1957-1979 ran parallel to efforts at the UN to achieve a negotiated agreement on undertaking space activities. Given the rapid technological developments, it was clear that international regulatory protections within the ambit of the UN was imperative. This was achieved through 5 international space law treaties.

## Drafting Treaties

The framework of treaty principles had support also of the increasing number of new members joining the UN. These were the erstwhile colonies which have become sovereign countries – one country one vote. And, therefore, there was need to create language for suggestions from the new members, such that the principle objectives of the super powers were not deviated or diluted. We understand the Outer Space Treaty principles governing activities in outer space for the exploration and use of outer space, including the Moon and celestial bodies in that context.

The Outer Space Treaty, 1967 is ex-cathedra and sets out the Principles for *freedom of exploration and use, scientific investigation in outer space*, stating that outer space is the *common interest to all countries* and is the *province of all mankind* to be used for *peaceful purposes* for the *benefit of all countries*, regardless of their level of economic or scientific development. The treaty *prohibits national appropriation* of outer space through claims of sovereignty, occupation, use or any other means, requires *conformity* with international law including the UN Charter.

As I said, the Limited Test Ban Treaty provision related to outer space was included in the Outer Space Treaty in Article IV– prohibiting placement and use of nuclear and WMD anywhere in space including in the orbit of the earth and placement and use on the Moon and celestial bodies.

Also prohibited in the placement of Nuclear Weapons and WMD in orbit or installation on celestial bodies or from being stationed in Outer Space in any other manner; and the establishment of military installations, fortifications, testing any type of weapon and conduct of military maneuvers on celestial bodies. It also requires the Moon and celestial bodies to be used exclusively for peaceful purposes. However, Article IV does not preclude the use military personnel for scientific or peaceful purpose; nor the use of equipment which owes its origin to military development for peaceful purpose.

By implication, everything that is not prohibited, i.e., nuclear/WMD, is permitted, thereby supporting military use of Outer space. This proposition in international law is based on the Lotus principle. It refers to the 1927 Permanent Court of International Justice judgement in the SS Lotus which laid down the *principle that Sovereign States may exercise sovereign will provided it does not contravene any specific prohibition*

In other words, given that outer space treaty does not providing specific prohibition on military use of outer space including the Moon and celestial bodies it is permitted, additionally Article IV para 2 permits the use of military personal and military equipment for scientific or peaceful purpose.

The treaty also recognizes astronauts as *envoys of mankind* and requires *mutual assistance* in the event of an emergency or accident and to undertake. In fact, the outer Space Treaty Article 9 mandates the Principle of *cooperation and mutual assistance* in undertaking space activities *with due regard to corresponding interest of all State Parties to the Treaty*.



Allow me to give you an example each of the principles of *international cooperation*, and of *due regard to corresponding interest*. The first – as you would have read in the newspapers, *international cooperation in outer space* is being played out as we speak, in response to the incident involving the Russian Module in the International Space Station which was hit by a micrometeorite, damaging its windowpane, causing a loss of pressure and putting the two cosmonauts to risk. Presently, NASA and Roscosmos are working together seamlessly to bring the two cosmonauts back to Earth safely, regardless of any political tensions on the ground. This is the magnificence of the Outer Space Treaty. It's amazing how the treaty has brought the nations together in outer space – geopolitics here on Earth around Ukraine notwithstanding.

The second – is in context to the ongoing efforts underway at the Conference on Disarmament, where pursuant to the UNGA Resolution 76/231, States are engaged in the *Open-Ended working group on reducing space threats in outer space through norms, rules and principles on responsible behaviour*. When we read through submissions filed by states – it becomes clear that for the most part these are based on or derived from OST Article 9 principle which requires state parties undertake space activities *with due regard to the corresponding interest of all State Parties*.

The treaty mechanisms which amplify and qualify *peaceful use of outer space*, in fact have enabled the military use of outer space. The criticality of OST Article IV is clear.

## **Space Treaties**

Outer Space Treaty (OST), 1967 (*Principles for space activities for the exploration and use of outer space, including the Moon and Celestial Bodies*).

The OST has been ratified by 112 States.

The four subsequent space treaties amplify specific provisions of the Outer Space Treaty.

Rescue Agreement, 1968 (*Agreement on the Rescue of Astronauts, Return of Astronauts and the Return of Objects Launched into Outer Space*) amplifies Outer Space Treaty -Article V.of the Outer Space Treaty. It has been ratified by 98 countries.

The Rescue agreement requires and ensures international cooperation in providing protection for humans travelling into outer space, including on the Moon and celestial bodies. Such *space-farers* are designated *envoys of mankind* and require the safe return of astronauts (by whatever names called)and the space-objects to their launching states.

It may be useful for us to revisit the rescue agreement in view of India's proposed manned space flight.

The Liability Convention, 1972 (Convention on the International Liability for Damage Caused by Space Objects) and amplifies Outer Space Treaty – Article VII. It has been ratified by 98 countries.

The OST holds the *launching state internationally liable* for any damage caused to the space asset of another State Party or personnel on board by its state assets and by the space object owned by the State Party or itscommercial entities, in air space, on the earth and in outer space.

The Registration Convention, 1974 (Convention on Registration of Objects Launched into Outer Space) amplifies Outer Space Treaty- Article VIII. It has been ratified by 72 countries.

The Convention requires identification for all space objects that are launched in outer space, similar to how cars require registration numbers before plying on the roads. It is relevant to commercial entities because

under its provisions the space objects (launch vehicle, satellite are required to have international designators (like a car registration number) for operating in outer space.

This is critical for identifying the spacecraft or part thereof which has caused damage, for the purpose of *attribution of liability*.

Moon Agreement, 1979 (Agreement Governing Activities of States on the Moon and other Celestial Bodies) amplifies Outer Space Treaty – Article IV and Article XII. It has been ratified by 18 countries.

The Moon Agreement uses the term Heritage of Mankind in context to the planet, and, sets-out a prescription for an international mechanism for the management of planetary resources when extraction becomes commercially viable. Negotiating history indicates that the US and USSR had no objection to the *common interest principle* being applied in the Moon Agreement. It was the developing countries which insisted on the inclusion of *heritage of mankind* principle, with the aim of ensuring that the lunar resources are used for the benefit of all countries.

In international law, as you would know, there is the concept of *heritage of mankind*, and has been linked in context to planetary resources. It had been used earlier in the UNCLOS – Sea Bed Treaty, 1971 and the Antarctica Treaty 1959.

## **Off Earth Space Activities**

The inclusion of *heritage of mankind* principle in the Moon Agreement seemingly linked commercial utilization of extracted lunar resources to the OST Article 1 principle *for the benefit and in the interest of all countries irrespective of the degree of economic and scientific development*. It is generally believed that this proposition does not find favour with commercial enterprises involved in developing advanced technologies for resource

extraction business verticals.

The US Artemis Programme related to planetary resource extraction for commercial purpose and for establishing long term human habitation of the Moon, and later, on Mars is gathering speed. With 23 countries having signed the Artemis Accords to participate in the project which is creating enormous technological and commercial synergies.

## Spacefaring Nations

At this time, there are 9 space faring powers (down from 11). Of these 8 established military space programmes *ab initio*. India is the only country which established a civil space programme. These include-

Military space programme: (1) Russia [USSR] in 1945 ; (2) USA in 1945; (3) China in 1959( *Mao wanted China to be a superpower like USSR*); (3) Israel in 1960 ; (4) Japan in 1969; (5) ESA in 1979 : ( *intergovernmental space agency*); (6) North Korea in 1980; (7) Iran in 2004; (8) South Korea in 2022; and (9) Civil Space Programme India in 1972. Military use of outer space programme announced in 2022

Two space faring powers with military space programmes are now inactive: (i) France, established in 1965; and (ii) Ukraine established in 1991.

## Cold War & Pacta Sunt Servanda

So, how does it all work? The Outer Space Treaty does not have mechanisms for monitoring, verification or for enforcement or consequence. OST does not even have a definition clause. Yet, up until now, no space faring power has conducted space activities, except for *peaceful purposes*.

In short there has been no breach no violation in outer space. Now, in international law, parties to a treaty are expected to act on good faith basis.

*Pacta Sunt Servanda* – the agreement must be kept.

In reality, however, outer space is all about geopolitics. Everything that is in outer space starts and ends here on Earth. At the relevant time, despite the adversarial positions during the Cold War, the US and USSR found a *modus vivendi* in outer space, and consistently conducted space activities in conformity with the principles of the outer space treaty – thus establishing State Practice in respect of space activities. New space faring countries similarly established State practice, such that Principles have evolved into binding rules of international customary law.

This is not to say that the years from 1957- 1991 did bring challenges which had potential to threaten the equilibrium in outer space. One such example was in 1983 when USSR shot down near Kamchatka a Korean Airways Flight 007 flying enroute to Seoul from Anchorage. The international uproar and geopolitical posturing notwithstanding, within a week of the incident President Regan announced that GPS would be made available for civil aviation. Within two months the USA and USSR had formed a coordination committee to ensure the safety and security of civil aviation. The incident led to amendments in the Chicago Convention mandating that *force* against civil aircraft would be used only as a last resort.

Finally by 1996 GPS paved the way for the GNSS (Global Navigation Satellite System) for ATM (Air Traffic Management)/ CNS (Communication Navigation and Surveillance) for civil aviation together with supporting SBAS systems (space based satellite systems). This includes our own GAGAN (GPS Aided GEO Augmented Navigation satellite system).

## **1991 – First Space War & Unipolar World Order**

1991 was a watershed year. The Persian Gulf War 1990-91 was the *first*

*space war* which demonstrated the use of the full range of military space technologies and space capability had been integrated into modern military assets and deployed in terrestrial conflict. That is use of space-based satellite services as a force multiplier. Thereafter, the development of military space technology and capability became an essential component of national defence and security architectures of every country.

In 1991 the Soviet Union dissolved and the new unipolar world order emerged. This led the USA to gradually allow its military space technology for commercialization, paving the way for the emergence of the commercial space sector.

In India Prime Minister Narasimha Rao and Dr. Manmohan Singh liberalised our economy in 1991. The Internet and satellite bases services – telecommunications, broadcasting, google earth entered our lives. The commercial IT and satellite services sector developed in India.

## **Global Commercial Space Economy**

Following the emergence of the unipolar world order, the US opened up its technology for commercialization between 1995 and 2002, when we look at the revenue of the global space economy it's amazing that in about two decades since 2004, the global revenue has reached \$469 billion in December 2021. The US is the dominant commercial space power.

When we consider India, having entered the international commercial space launch market in 2007 with the launch of Italy's Agile satellite, we now have a share of about 2% in the international commercial launch market, but India is no longer offering the cheapest launches.

## Challenges for the Commercial Space in India

We have been discussing this possibility since May 2020. And, for sure there have been developments.

But a major challenge is the absence of a comprehensive policy for the development of commercial space activities sector in India. And, an accompanying roadmap for implementation document that contains clearly identified milestones. Importantly, a carefully drafted space activities law that factors the nuances of the international space treaty regime relative to the challenges that commercial space operators will have to confront needs to be put out.

From my limited understanding of it, there is perhaps some difficulty in properly arriving at an understanding in context of how to properly and appropriately implement the space treaty provisions to support commercial space activities. This is a complex subject as it is - and I am setting out some related treaty provisions for your consideration.

## The Conundrum: Commercialization of Space

The OST distinguishes *exploration (including scientific investigation and missions)* from the *use of outer space – which is understood to mean the use of natural space resources and commercial exploitation of natural space resources.*

Specifically in context to non-government entities undertaking space activities -there is one provision in OST exclusively related to NGO/private co – commercial entities. That is Article VI. And two provisions in OST applicable to the State Party and its NGE (Non-Government Entities). That is Article VII and Article VIII.

Article VI -At the time Outer Space Treaty was being negotiated, the Soviet Union favoured only state activity, whereas the United States

favoured inclusion of commercial space activities. This was because, already by 1963 the US had already started operating the Communication Satellite Corporation (COMSAT), which was being regulated by the FCC and was providing several countries across the Atlantic with communication services.

Finally, it was agreed provided that the relevant State Party (in this case the US) would have *international responsibility* to assuring that such NGO conforms to the Outer Space Treaty, its space activities would be undertaken under its *authorization* and *continuing supervision* of the space object/activities (i.e. until a specific commercial space object, whether active or inactive, is de-orbited).

In our own effort for a regulatory framework for NGE space activities, it may be helpful to understand the word “authorization” used in Article VI, as essentially referring to a license or permit or permission from the government to do something. There is really no need to get stuck on the word “authorization” the means, manner and nomenclature we use – the precise terminology we use in our national space law is for us to apply our minds to – so long as a NGE undertakes space activities under authority granted to it by government.

Article VII - mandates the State Party to be internationally liable for damage caused by its space object or the space object of its NGE to the space object, natural and juridical persons of another spate party or its NGO on the Earth, airspace and in outer space. The treaty establish “fault based” liability in outer space and “absolute liability” for damage caused in air space and on the earth.

This is the genesis of the on-going debate in India about liability, insurance, etc. Broadly, think of it as you would your motor car. There are two types of insurance, one for the technology and the space object itself in case it



fails, perhaps it has millions of dollars at stake in these services. The second is third party insurance. But, of course, within that framework there are several complexities that come with insurance that are unique to space activities. It is reasonable assumption that the kinds of insurance products available in the market for space activities will determine the sum assured etc. I believe that given that ISRO ensures our national space assets, if that be correct, perhaps ISRO may be encouraged to do a workshop on this subject.

Article VIII: The third provision of the outer space applied to the State Party and its private company, because under its provisions the State Party has the obligation to enter the space object launched in the national register of space objects, and to provide information related to it to either of the UN international registers of space objects.

It is easy to understand this requirement. It is akin to the fact that without registration, you cannot ply your vehicle on the roads. The registration number is critical for purpose of *identification* of the space object, for the purpose of attribution of liability, should it cause damage under Article VII.

Importantly, Article VIII clarifies that the ownership of a space object/ does not change due to its presence in outer space or its return to the Earth. This is critical for especially for a private company, as much as a State Party itself.

In reference to our own proposed space activities policy/law the Article VIII clarification as to “ownership” of the space object is very important -it is clear that a State Party would be remiss to claim ownership of IPR created in orbit by its NGE/private Company on its space object -on the basis of an apparent "*deeming provision.*" In fact, such a *deeming provision* does not exist in our patent law.

In the final analysis, the institutional approach is the prime factor. Is the purpose of the policy and law limited to regulating private companies – or – is the purpose of the policy and law directed towards the establishment and development of a commercial space sector in India?

## **Threat of Debris to Space Operations & COPOUS**

The first-time debris started getting tracked was in 1991. Debris in outer space is the single biggest threat to space operations. The earliest trackable-catalogued debris to be catalogued was in 1991. The increasing debris resulting from routine space activities has been resulting in unintended collision in outer space.

The emphasis at the COPOUS has been on promoting Transparency and Confidence Building Measures, non-binding voluntary codes and technical standards – for consideration and guidance of state parties. The State Parties are not inclined to binding rules and treaties.

The earliest effort to establish best practices to mitigate debris in space was in 1993 by the Inter -Agency Debris Coordination Committee (IADC) which issued Debris Mitigation Guidelines (which are updated annually). Other efforts include the International Code of Conduct for Space Activities (2010); ITU-R 1033.2 guidance on disposal of satellites in GSO /environment protection (2010); ISO 24113:2019 debris mitigation requirements.

## **Absence of Consensus in COPOUS**

The persistent absence of consensus in the COPOUS for over two decades has resulted in failure to provide required regulatory guidance for new space activities, including increasing space debris. The most urgent is to regulate operations in space of the rapidly growing numbers of mega

constellations in LEO to provide 5G satellite broadband communications worldwide. The resultant international regulatory vacuum is being filled up by national laws to advance space activities in outer space including the Moon and celestial bodies. The latest relevant to space debris is the US Orbits Act, 2022, which requires inactive satellites in any orbit to be de-orbited within five years of becoming inactive in order to reduce debris. But correspondingly it will increase the amount of debris entering air space and on the Earth surface.

## **Liability Accident Damage Claims for Commercial Space Operators**

Clearly, debris is the acknowledged threat, especially relative to commercial space operators, especially in case of damage to active satellites. Yet, the only example of a live commercial satellite getting damaged in orbit was when in 2009 the active communications satellite owned by Iridium was hit by the inactive Russian Kosmos satellite.

Although the debris was identified, Iridium did not file a claim for compensation. The reason was that the procedural aspects of imputing “fault based liability” (law of tort) for damage caused in outer space, requires not just identifying the space object which caused damage; its owner-operator/launching state, but also for the Claimant ( in this case Iridium) to demonstrate that it did not in any manner and form “*contribute*’ to the event which resulted in damage caused to its satellite/space object.

In the case of Iridium, the company had been receiving regular SSA/STM reports and had taken a commercial decision to ride out despite the “collision avoidance” alert. This means that even Iridium had filed a claim, the Russians would adopted the defence of “contributory negligence” on part of Iridium which was in control of its satellite, had advance STM alert, but did not undertake a collision avoidance manoeuvre.

## **Challenges for effective SSA (Space Situational Awareness)/STM (Space Traffic Management)**

Satellite operators are reporting increasing frequency of STM alerts that are false positives in respect of conjunction warnings and collision probability warnings, resulting in requirement to undertake collision avoidance maneuver planning, which is a time consuming, personnel-intensive operation and imposes a cost burden for most satellite operators -even if the ultimate decision is to “fly through” a close approach.

Effective Space Traffic Management service alerts depend on the data base for space situational awareness related to the identification of a satellite (physical identification and identification by radio frequency emissions) with a supporting database which provides high level of information, which is regularly updated.

The Registration Convention requires states to maintain a National Register for Space Office and provide information to the UN Secretary General. The UN Secretary General is also required to maintain International Registers of Space Objects, each under the Outer Space Treaty and the Registration Convention. However, the actual submission of the required details of satellites launched, in active and no longer in orbit, is required of the states to the extent possible and practicable. However, countries typically do not submit information on immediate basis since this is not mandated. Military satellites are mostly not registered. However, a satellite requires an international designator to conduct activities in outer space. Thus, the COSPAR (Committee on Space Research), a private entity, issues International ID designators to artificial space objects/satellites. Because UN registries and the COSPAR are interlinked, the corresponding status of whether a satellite is UN registered or not and vice versa can be ascertained.

In addition to identifying satellites, a STM service provider needs also to identify all other artificial space debris including trackable fragments. The UN NORAD Satellite Catalogue (SATCAT) is perhaps the most extensive and comprehensive catalogue of every single piece of debris to which identification numbers are assigned. The SATCAT is open for access to all users. In the final analysis, a SSA/STM service provider would be best served by developing his own catalogue.

The second means of identification is through the RF emissions of a satellite. The International Telecommunications Organization (ITU) is the international spectrum regulator, allocates RF to all countries and maintains the most complete data of all the satellites in space. ITU provides to specific countries, RF identification designators which are internationally coordinated before being deployed in satellites. ITU is not interlinked to the UN and/or COSPAR registries.

## **Incidents of Accident, Damage, Liability and Claims**

Airspace: There has been no incident involving damage caused by a space object to aircraft in flight, as yet.

Outer Space: 2009 collision of the Iridium 33 satellite with the defunct Russian KOSMOS 2251 satellite has been the only incident involving an active commercial satellite. In that case, the debris was identified, no claim was made.

Surface of the Earth: In 1978 crash of the Russian KOSMOS 954 into Canadian territory, which resulted in extensive surface contamination from the satellite's nuclear power sources. Canada brought a claim against Russia under both the LC and customary international law. In negotiations, Russia acknowledged liability by paying US\$6 million in damages to Canada.

## **Prosecution of Claims by State & Commercial Operators**

The space treaties, like all international treaties are applicable as between sovereign states. OST provides that State Parties may resolve matters including related to liability/damage through the UN Secretary General or through diplomatic channels.

Even if a commercial operator were to seek facilitation from its government, there may be difficulty in view of geopolitical considerations. Even if that did happen, the commercial operator would not be able to participate directly in the process, or even if he could, may not be permitted assistance of his lawyer. This is quite apart from the question of quantum of damages

International treaties do not apply as between a sovereign state and a private citizen. Therefore, private citizens can seek redressal and resolution only through national legislation. If India's commercial operators are to be empowered with actionable rights in context to activities in outer space, it would require parliament to enact a national statute that not only implement international obligations to which India is committed, but also grants actionable rights to access appropriate legal remedies nationally and internationally.

The difficulty of all the fundamental aspects including identification of space object, appropriate state of registry, launching state, such SSA/STM reports as may be available, quantifying damage and filing a claim, quite apart from the related procedural matters makes it very difficult for a commercial space operator.

Finally, let us consider the possibility of an Indian private commercial space launch service provider. The question to be asked would be status of commercial space launch service provider relative to its relationship to the "launching *state*" under the space treaties. There are many fundamental

issues that need careful and thorough examination if the plan is to develop a commercial space sector in India.

### **Patent Protection (IPR)**

Patent Protection for inventions in outer space and celestial bodies should be an important agenda item. It needs proper understanding and appropriate affirmative action in favour of inventors in context to Article VIII Outer space Treaty.

Finally, I am glad the Indian Space Policy is still the works. As for drafting a policy and law, all necessary stakeholders should have to be involved, particularly because it involves military and commercial interests. The institutional approach is the key.

## **About the VIVEKANANDA INTERNATIONAL FOUNDATION**

The Vivekananda International Foundation is an independent non-partisan institution that conducts research and analysis on domestic and international issues, and offers a platform for dialogue and conflict resolution. Some of India's leading practitioners from the fields of security, military, diplomacy, government, academia and media have come together to generate ideas and stimulate action on national security issues.

The defining feature of VIF lies in its provision of core institutional support which enables the organisation to be flexible in its approach and proactive in changing circumstances, with a long-term focus on India's strategic, developmental and civilisational interests. The VIF aims to channelise fresh insights and decades of experience harnessed from its faculty into fostering actionable ideas for the nation's stakeholders.

Since its inception, VIF has pursued quality research and scholarship and made efforts to highlight issues in governance, and strengthen national security. This is being actualised through numerous activities like seminars, round tables, interactive dialogues, Vimarsh (public discourse), conferences and briefings. The publications of VIF form lasting deliverables of VIF's aspiration to impact on the prevailing discourse on issues concerning India's national interest.



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