

LEGAL IMPASSE – COMMERCIALISATION OF SPACE THROUGH REUSABLE SUB-ORBITAL LAUNCHERS

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Abstract

Sub-orbital launching is an area that has a vast potential for growth in the commercial front. Till now technology behind sub-orbital launching is only used for missile and defence purposes by number of countries. A number of entrepreneurs are in the process of making a reusable sub-orbital launch vehicle; which will introduce a new challenge relating to which area of law need to be used to regulate its use. Whether it needs to be address under the Air law or Space Law? This paper explores how sub-orbital launching is considered under the space law and whether it can be brought under the basic definition of space activity under the Outer Space Treaty, 1967. Furthermore, the paper will also look into the effect of all the main space treaties and some domestic law. The need for further improvement or clarification in the space treaties due to the progress in the space technology is also addressed. The paper concludes with a note on the importance of addressing this issue at the earliest, as Law should always try to get along with the technology and not a back runner.

Introduction/ Background

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For the last half a century mankind is having euphoria to explore the unknown world of outer space. Space has been since used for making opportunities in civil, military and commercial front. Now lately, commercial front is trying to make use of space technology to improve transportation in earth through sub-orbital launchers. Till now sub-orbital launch missions have been limited to sounding rockets, national missile programmes, astronomical and microgravity research missions.

The term suborbital launch means a launch which does not have enough energy or velocity to reach an orbit. The new age sub-orbital launchers are devised to transport human and cargos through the sub-orbital path and can be used again and again. This new age sub-orbital reusable launch vehicles travel through air space to reach outer space and will in most cases come back to air space with in a short span of time. Hence, unlike all the present day space or air vehicles, Sub-orbital reusable launch vehicles will be subjected to a mixed regulation of both Air law and Space law. Thus, this new fleet of vehicle is not backed with the required legal policy and regulation.

Sub-orbital launchers have a lot of advantage compared to the orbital launchers, such as less vehicle fuel, reduced vehicle weight, greater safety and more passenger comfort. In addition, it also uses less complicated technology.

The passengers are subject to pressure of a vehicle travelling at Mach 3 to Mach 5 as opposed to the orbital space launch which will be travelling at Mach 25.

As per a study on the suitability and benefit of sub-orbital reusable launchersⁱ, Sub-orbital launch services can be provided at 64 times less risk than orbital and at 10 percent the cost of orbital systems. This proffers a 640 times improved risk-reward ratio to orbital RLV's. In addition to this, the start up capital for a sub-orbital launch vehicle project is much less than orbital launch vehicles which make it very attractive for private commercial entrepreneurs.

At the moment, there is no specific international legal regime for the sub-orbital reusable vehicles. The constant use of sub-orbital vehicle for commercial purpose will surely raise questions regarding sovereignty of nations. This issue will be highlighted when these vehicles start to routinely take off and land from anywhere in the world which have a necessary facility. This constant use will raised a number of legal questions, which is better to be answered at the earliest.

As per Outer Space Treatyⁱⁱ, 1967, Article VI states that:

“ State parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether which activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in

outer space, including the Moon and other celestial bodies, by an international organisation, responsibility for compliance with this Treaty shall be born both by the international organisation and by the States Parties to the Treaty participating to such organisation”.

Hence, it is the responsibility of each country to make sure that all the commercial activities which have an element of space into it should be authorised and supervised continuously. In United States of America, the Commercial Space Lunch Act of 1984 made it clear that the secretary of Transportation have the authority to license suborbital rockets, which answer the authorisation part of Article VI of Outer Space Treaty. The Commercial Space Transportation Act (CSTA) was passed by US congress in 1994 with the stated objective of “to provide that the Secretary of Transportation is to oversee and coordinate the conduct of commercial launch operations, issue and transfer commercial launch licenses authorizing those operations, and protect the public health and safety of property and national security and foreign policy interests of United States”. This makes it clear that Commercial Space Transportation Act symbolize Article VI of the Outer Space Treaty into its national legislation.

In the absence of any international legal regime regarding sub-orbital reusable launchers, United States of America have answered its obligation under the existing Legal regime. Hence the important question is the need to find an answer to whether the existing international legal regime is enough to address the legal issues raised by the commercial use of sub-orbital reusable launch vehicle.

Different aspects of sub-orbital launcher Development

Sub-orbital launch vehicle has mixed characteristics of airplane, orbital space craft and also with launch vehicles. But they are different from all of them in their peculiar way. In the first stage of development of the sub-orbital launchers, it will need to take lower orbital for its test flights, which comes under the regulation of Air law. In United States, Federal Aviation Administration (FAA) is responsible for regulating the certification and operation of the airplane and has the legal jurisdiction over the airspace from ground to 60,000 feet. The Federal Aviation Regulation contains provision for initial low-altitude flights test, through which, the Reusable launch vehicle prototype will undergoⁱⁱⁱ. In addition to this, as the flight test is carried in the airspace, the regulations regarding airspace assignment and use, minimum airworthiness standards and vehicle certification will also be applied.

Upon completing its initial developmental launches, the advanced flight testing will be done above the 60,000 feet air limit of FAA and hence is to be certified under the Commercial Space Transportation Act. Even here, the question of passing through the airspace of another country on its way to and from outer space will pose a question that need to be answered.

In this paper, we are only dealing with the issues that arise after test stage.

Sub-orbital launchers expound a number of issues with important economic and national security implication in areas like science, imaging and tourism. Each of these areas has different implication and will have contrary effect on application of air law and space law.

Legal issues Involved

The first main issue that need to be answered is whether rules of air law or space law should be applied to a sub-orbital reusable launcher. The very same issue have been raised before upon innovation of space shuttle. Space shuttle ascends to outer space with the assistance of rockets like a conventional space launch and descends back from outer space like an aircraft by gliding through the atmosphere.

In the case of shuttle, it have been established that space law is to be applied in reference to the Paris convention of 1919, Chicago convention of 1844 and according to Outer space treaty of 1967 along with the subsequent major international conventions dealing with space law^{iv}. This conclusion can also be reached from the overall purpose and functions of the shuttle^v.

In the case of sub-orbital launchers, the vehicle may only spend relatively short time in outer space in the course of the flight and the frequency of the flight will be much more than shuttle expedition. This can raise the issue of navigating over foreign airspace at lower altitude and may be considered as an intrusion to the sovereign airspace. Even though the principle of the freedom of exploration and use of outer space, a cardinal principle of the 1967 Outer Space treaty, in a sense implies the freedom to go into outer space and also the freedom to return to earth from outer space, these frequent flight of sub-orbital reusable commercial launch may be viewed as something in excess of the freedom ascertained in Outer Space Treaty of 1967.

The very need of the time is to make a demarcation of where the Airspace is ending and where the outer space is starting^{vi}. All the attempts in the United

Nations to establish a boundary line at a height of 100-110 Kilometres and granting space-faring nations the right to innocent passage through the underlying airspace above the territories of other countries have to date not received sufficient support^{vii}. Even though some states do follow it, there is neither consistent state practice nor *opinio juris* to support this.

Under customary international law, outer space constitutes *res extra commercium* which is not subject to national appropriation or the territorial jurisdiction of any State^{viii}.

Even though there is no universally accepted legal definition for outer space^{ix}, outer space under general international law would at least begin from the lowest point reached by an artificial satellite, in the other words, the lowest perigee ever achieved. For this reason, the International Law Association at its 53rd Conference in Buenos Aires in 1968, at a joint session on Air Law and Space Law, approved a resolution adopting the lowest perigee achieved by any artificial satellite on 27th January 1967, when the 1967 Space Treaty was opened for signature, as making the beginning of outer space for the purpose of interpreting the term 'outer space' in the Space Treaty^x. At its 52nd Conference in Helsinki, the International Law Association stated in its report that it considers that the practice of States is consistent with the view that air sovereignty does not extend as far as the lowest perigee of any satellite so far placed in orbit^{xi}.

Prof. Kopal opines, "The lowest perigee at which space objects are still able to continue effectively their orbiting around the Earth for a longer period of time meets these requirements and remains a valid basis for defining outer space despite a rapid progress in space

technology"^{xii}. Some instances where lowest perigee achieved is that of the United Kingdom Skynet-IIA (1974) at 96 kilometres (approximately 60 miles), and that excepting this and another one at 104 kilometres, all the other satellites have perigees above the 110-kilometre line (approximately 68 miles).^{xiii}

The matter may be solved by setting up a upward limit of national sovereignty at a specific height anywhere between the area where satellite can orbit the earth and where aircraft can fly, and launching countries do not have to get a special permission from the underlying states to pass over their space on the way to and from outer space^{xiv}. Another option is to give space faring nations the right for innocent passage while ascending or descending from outer space, even though, in this case innocent passage need to be defined.

The committee on the peaceful Uses of Outer Space at its thirty-fourth session of the legal subcommittee finalised a text of a questionnaire on the possible legal issues with regard to aerospace objects. Sub-orbital reusable launch vehicle is a type of aerospace object which can travel to and forth to Outer Space. The very purpose was to seek the preliminary view of the State members to the committee on the various issues relating to aerospace object, mainly, on matters relating to the definition and delimitation of outer space. To the question of "Does the regime applicable to the flight of aerospace objects differ according to whether it is located in airspace or outer space?" majority of the states answered that the vehicle should be dealt under air law while in airspace and under Space law while in outer space. In general, the countries have expressed a view that the "very purpose" of the flight can also be taken as an element to determine which

law is applicable during its entire flight. In case of a sub-orbital reusable launcher, which will be spending very short time in space before returning back to earth, this will be a hard matter to be solved and a combination of air law and space law may be applied depending on its position. Lack of consensus on the delimitation of outer space can deepen this problem as to where the air law will start applying and where the question of sovereignty of a nation through which the flight path of the sub-orbital launcher passes.

The main principle of Air law is embodied in the Chicago Convention, 1944 which states that every state has complete and exclusive sovereignty over the air space above its territory^{xv}. Under the established principles of international law, airspace over national territory is under the complete and exclusive sovereignty of the subject State.

Article 2 of the Chicago Convention, 1944 specifies, for the purpose of the convention, the lateral limits of airspace sovereignty. Although, the Convention makes no express reference thereto, it appears by implication to accept also the proposition that there is no national sovereignty over the airspace above the high seas and *terra nullis*, which constitutes, therefore, free flight space.

According to Article V of the Outer Space Treaty, 1967, astronauts are considered as the envoy of mankind and shall render to them all possible assistance in the event of accident, distress or emergency landing on the territory of another state party or the high seas^{xvi}. The Rescue Agreement^{xvii} of 1968 also considers all the persons in a space craft as astronauts. The sub-orbital reusable launch vehicle eyes the commercial benefit of the space tourism and it is clearly

highlighted in the report^{xviii} issued by the US department on commerce and Office of Space Commercialisation. Therefore, the most prominent question is whether all the passengers onboard a sub-orbital launch vehicle can be considered as the envoy of mankind. During the formation of the Space Treaties, this issue was not there and hence this issue also needs to be addressed.

Moving over to the next important issue, as per the Registration Convention^{xix} of 1975, launching state is required to register all the launches to earth orbit and beyond. It is also stated that, each launching state shall inform the Secretary-General of the United Nations of the establishment of such a registry and also information concerning each space object carried on its registry. The question with regard to sub-orbital launchers is that, whether they would also come under the preview of Registration Convention. It can be argued that sub-orbital launchers do not go to the earth orbit literally, but enter the outer space and return back to earth without orbiting earth. Further more, it is evident that in Article VI, that, each launching state is supposed to provide Secretary General of UN with Basic orbital parameters including: Nodal period, Inclination, Apogee and Perigee. This can also lead to the conclusion that sub-orbital launchers are not orbital vehicles and are not inclined to register each and every flight under the registration convention, unless, its mission is to orbit earth.

With respect to the Liability convention^{xx} of 1972, according to Article II, A launching State shall be absolutely liable to pay compensation for damages caused by its space object on the surface of the Earth or to aircraft in flight. Further more in Article III, it is stated that in the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons

or property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible. It should also be viewed that, shuttle was considered under the space law even though it lands like a conventional airplane. But in the case of sub-orbital launcher, which's main purpose is to travel between points on earth and not going to Earth orbit, absolute liability is a added burden. But an accident with a space object in outer space during its course through outer space can only be considered under Liability convention as of now, as, the application of Air law for damage occurred in outer space is not conventional. Here also the current legal frame work is not very clear and need to be having a clear cut principle to be applied for sub-orbital launchers.

Another issue that need to be addressed is imaging from a sub-orbital launch vehicle. In the report^{xxi} prepared by the U.S. Department of Commerce and Office of Space Commercialization, it is stated clearly that Military Surveillance and Commercial/Civil Earth Imagery as an emerging sub-orbital market. Taking Images from an airplane during its flight over another country is a violation of that countries sovereign authority of airspace. Even though, remote sensing is allowed from a satellite over any country, the main issue here is to determine whether imaging of earth during the ascending and descending of a sub-orbital launch vehicle is a violation of international law. For a sub-orbital vehicle, the duration of time it spends in space is very little and it passes through the air space of different countries during it ascend and descend, hence imaging of earth during the travel through airspace will be a violation of international law.

Concluding thoughts

Having gone through the bottle neck legal issues that is going to come before the legal fraternity, there is great need to find a way out of it. There is very few or literally no option available with the legal system now in place. Hence, there is an urgent need to find a new legal norm or legal system to solve these issues.

Before scrutinizing the short comings of the current Legal treaties relating to Outer-Space, it is worth also checking whether the sub-orbital launchers can be accommodated within the ambit of the current Air Law regime. Literally speaking, it is worth a try to include the new development in the Air traffic activity, as; main use of sub-orbital launchers is predicted in earth-to-earth transport. Moreover, including sub-orbital activity in the current Air traffic management, clear the dark clouds on the Space treaties, as there is no need to go for a big change in the treaties at least for the time being. The argument that can support to include sub-orbital launchers in the current Air traffic management and application of Chicago convention are 1. Main purpose of sub-orbital launcher would be earth-to-earth transport, 2. Most of the flight time is spend in Air 3. Registration is more appropriate to be like Aircraft and 4. Already existing perfectly working system.

While these four broad reasons support the use of the existing Air traffic management and existing law of Air transport to Suborbital Launcher, there is a need to look on the possible problems that may arise due to that. Even though the extent of Air space is not limited, with the technology available at the moment, there is an upper limit for aircraft to reach. With the inclusion of Sub-orbital launchers in to the class of Aircraft to apply the Air law, it is literally and theoretically extending the

limit of Air Law to the altitudes where Sub-orbital launcher can stretch to. These upper altitude heights of sub-orbital launchers are definitely above the path of at least some of the satellite in lower orbit. Hence, there is an overlaps of Space Law and Air law. It can also be taken as, extending Air Law towards what is now called as Outer Space, in a way, extending Air Space to a much higher altitude than what is considered now. This extending of application of Air law can upset the current setup of considering all the orbital satellites are in Outer-Space. Secondly, the sub-orbital launcher does not work on the same principle of aircrafts, buoyancy principle. It fires up into very high altitude, outer-space, and comes back as a space shuttle. The technology or the way it flies has no comparison with the way the current Aircrafts work. Hence, it is not suitable to be considered under the current Aircraft regime and there by, the current air laws. From the above line, it is clear that it is hard to consider reusable sub-orbital launchers under the current Aircraft scheme and the Air Laws.

The second line of option is to check whether the reusable sub-orbital launchers can be accommodated under the current Outer Space law. In the preceding chapters we have already looked into the different areas of Outer Space law which can become issues with start of reusable sub-orbital launchers. The main points that need to be taken into are 1. Sub-orbital launcher goes into the orbit just like a normal space lunch with lesser thrust and 2. At least part of the normal path of sub-orbital launcher does go through outer space. So in technical and practical sense, it possesses all the characteristic of a proper space launch. But, with increased use of sub-orbital launchers, it will be hard to be restricted under the space laws as a textbook space launch.

Another main issue would be the definition of astronauts in different Space treaties^{xxii}. Astronauts are considered as envoy of mankind. With the increased use of commercial sub-orbital vehicles, considering all the personals in those vehicles as envoy of mankind, do go against the core of these treaties. Moreover, registration of each and every launch of sub-orbital vehicle with the UN registration is somewhat unpractical^{xxiii}, when it is widely used as a mean of fast commercial transportation tool. Hence, from the discussion above, it is clear that there are both positive and negative points from the use of Air law as well as Space Law. It is also clear that both areas of law cannot fully find a solution to this new technological excellence. So there is a need of a new legal regime to support an International reusable launch vehicle organization. This new system should be responsible in firstly registration of all the reusable sub-orbital launcher or all new types of reusable launcher which might come in the future. The registry should be open to all the countries that have a launcher and that abide by the rules of the organization. With the increased use of Reusable sub-orbital launchers, the need for traffic management will need a more serious thinking and should be under the preview of the organization. The extension of use of remote sensing to sub-orbital launchers can create problem as it can be a violation of sovereign right of the country through which it ascent and descent.

In short this new legal regime should make rules on: 1. Registration, 2. Licensing, 3. Traffic Management, 4. Safety regulation, and 5. Dispute resolution. Each of the above mentioned area need deep study, as for the purpose of reusable sub-orbital launcher there is a mix of Air and Space law factors. Each launcher may be registered in their country of origin and the complete list of

registration should be deposited with the organization. Hence, the organization will be having a list of all the launchers with its registration country. Licensing need to be approved by the organization in conformity with safety regulation and traffic management. The launchers might also need to get license from their country of registration in compliance with their national law. Traffic management is an area that needs a lot of study and expert opinion. There are already lots of studies on Space traffic management, but, there is a need of consensus between all the countries. After the formation of the organization, an expert technical committee should be appointed to finalize the safety regulations. There will be a need of a standing committee to review the changes and new development and the rules need to be changed accordingly in consultation with the players in the field.

There will be a need to review the meaning of Article V of Outer Space Treaty, which consider Astronauts as envoys of mankind. With an increase in commercial space activity, there is a need to differentiate between astronauts and 'space traveler'. As of now, there is only one usage, that is, astronauts in all the space treaties. But in future, there is a need to specify the meaning of space travelers who are not considered astronauts for the purpose of treaties. This will also be relevant in relation to Rescue Agreement of 1968. The organization should define 'space traveler' in their formation charter and should also specify the rights of the 'space traveler' and the duty of all countries towards them. This definition is a must to properly define Safety Regulations. Exactly like traffic management, safety regulations also need an expert committee and need to be reviewed every year. Safety measures of a launcher should be one of the important criteria for issuance of license.

Last, but may be the most important, is a mechanism for dispute resolution. The organization should have its own dispute resolution mechanism. It should generally define its dispute resolution mechanism in its charter and should also make rules for it smooth functioning. It will need to define the ambit of the common benefit clause and the scope and implications of article VI of the Outer Space treaty, in light of present commercial space activities. There is also a need to define terms like 'Launching state' in the registration convention. Moreover, with the present scenario in mind, there is a need to check Article XIX, Paragraph 2 of the 1972 Liability Convention and particularly the relevance of the Article in encouraging the States to accept the binding nature of the Claims Commission decisions and wards. There might also need a re-thinking about the absolute liability of countries where the launcher is registered. After reviewing all the above terms and issues, a dispute resolution mechanism should be put in place, so that, commercial space activity through reusable launcher will not cause profusion of falling-out.

In the last 50 years the concept of space has changed a lot. But legal system has not kept pace with his technological counter-part. With the inclusion of reusable sub-orbital launchers, there is going to be a big revolution to the way space transportation was considered and also the participation of commercial parties in Space activity. Hence, it is in the general interest of all parties involved in it, that, the legal regime should also evolve a system to control and monitor the activities. It is different from the current concept of outer space and it is different from the current concept of air traffic. It has the values of both, but varies from both is so many different ways. So the new

regime should include all the areas, which are discussed earlier, and reach a stage through which, it can carry on the activities with out confusion and will lead the way for more future innovations.

ⁱ The Suborbital Road to Space: One Small Step for Man, One Giant Leap for Mankind 3 (Pat Bahn, Karen Shea, and Eric Dashlstorm ed. Space Front Magazine: The Journal of the Space Frontier Foundation).

ⁱⁱ The Treaty of Principles Governing the Activities of States on the Moon and Other Celestial Bodies, signed on jan. 27, 1967 and entered into force Oct. 10. 1967 (hereinafter referred to as the "Outer Space Treaty")

ⁱⁱⁱ See Legal Issues for Commercial Reusable Launch Vehicle Flight Operation, 3 (Rene' J. Rey, Space Treaty and Legislation, SpSt 565 University of North Dakota, Grand Forks, December 12, 1996).

^{iv} The Space Shuttle and The Law 2-5 (S. Gorove ed. 1980)

^v *Id.* at 5

^{vi} See Studies in International Space Law, 647 (Bin Cheng, ed. 1997)

^{vii} U.N. Doc. A/AC 195/C.2/L.139.

^{viii} Cheng, Bin, *Studies in International Space Law* 393 (1997)

^{ix} Smith, Milton L., *International Regulation of Satellite Communication* 183 (1990)

^x ILA, *Report of the 53rd Conference, Buenos Aires* 110(1968)

^{xi} ILA, *Report of the 52nd Conference, Helsinki* 200(1966)

^{xii} Kopal, Vladimir, "Issues Involved in Defining Outer Space, Space Object and Space Debris", 34 *Proceedings of the Colloquium on the Law of Outer Space* 38 (1991).

^{xiii} See Cheng, B., 'Legal Implications of Remote Sensing', *Earth Observations from Space and Management of Planetary Resources: Proceedings of International Conference Organised by CNES and ESA, Toulouse, March 1978*, p.597.

^{xiv} See Developments in Space Law Issues and Policies, 358 (S Gorove, Martinus Nijhoff Publicahers, ed.1991)

^{xv} Article 1, Chicago Convention, 1944

^{xvi} Article 5, Outer Space Treaty , 1967. *See also* Lachs, Manfred, *The Law of Outer Space* 79 (1972)

^{xvii} Agreement on the Rescue of Astronauts, the return of Astronauts and the Return of Objects Launched into Outer Space, April 22, 1968 (herein referred to as the "Rescue Agreement").

^{xviii} See Suborbital Reusable Launch Vehicle and Applicable Markets October 2002, 27 (prepared for U.S. Department of Commerce Office of Space Commercialization)

^{xix} Convention on registration of Objects Launched into Outer Space, Jan. 14, 1975 (herein referred to as the "registration Convention").

^{xx} Convention on the International Liability for Damage Caused by Space Objects. March 29, 1972 (herein referred to as the "Liability Convention").

^{xxi} *Supra* n. 10, p.23.

^{xxii} See Article V of Outer Space Treaty of 1967, Agreement on the Rescue of Astronauts, the Return of Astrounats and the Return of Objects Luunched into Outer Space of 1968.

^{xxiii} See *supra* n.xix