

Bekim Nuhija, Associate Professor

b.nuhija@seeu.edu.mk

Stefani Stojchevska, Postgraduate Student

ss26215@seeu.edu.mk

Faculty of Law – South East European University
Tetovo, Republic of North Macedonia

**BOUNDARY DELIMITATION OF THE NEAR-SPACE ENVIRONMENT:
AN INTERNATIONAL BLIND SPOT FOR MILITARY SPACEPLANE
OPERATIONS**

Abstract

This paper examines the continuous legal issue of the boundary delimitation of the notorious emergence of the near-space environment, which particularly focuses on the utilization of spaceplanes as hybrid aerospace vehicles for rigorous military application. With the recent international acknowledgment of the Air Force's X-37B military spaceplane, the near-space environment can be perceived to possess significant potential for various military operations. However, international law is currently dealing with two crucial issues which manifest lack of legal definition in regards to: 1) the identification of military spaceplanes as hybrid space objects, and 2) the notion of "Aerospace Law" as a new legal regime applied to suborbital flights for military purposes. Consequently, due to its combined atmospheric features of both airspace and outer space, the near-space environment is not yet properly regulated in terms of military application. The lack of legislation contributes for near-space to be regarded as an international blind spot, allowing sovereign states to perform military operations above their airspace and even above the airspace of another state, often without permission or acknowledgement. Legal clarification would offer international law the application of various rights and obligations addressed to a large specter of aircrafts, aerospace vehicles and space objects to distinctively operate in all three zones.

Keywords: Military, spaceplane, near-space, delimitation, aerospace

INTRODUCTION

The interests of the international community for airspace utilization, and consequently, its legal regulation, began with the early emergence of air transport. Planes, as it is commonly known, were primarily used in warfare both as a means of attack and as a means of defense. With the advent of the first aircraft, regardless of its ultimate purpose, the issue of airspace regulation was raised, which was originally covered by the 1919 Paris Convention and more recently, the 1944 Chicago Convention.

According to Article I of the Chicago Convention of 1944, which has been ratified by practically all the States concerned with aviation, other than the States behind the Iron Curtain, it is definitely established that the various States have complete and exclusive sovereignty over the air space above their territory. (Honig 1956)

And while nowadays the notion of civil aviation accentuates the utilization of planes as a means of transport that effectively connected nations, this does not necessarily mean that we should underestimate the current rules of international air law, where a particular state has sovereignty over airspace and moreover, the ongoing tendencies of states to simultaneously define their sovereignty of airspace specifically for military purposes and defense, in general. Complementary to this scenario, the innovational emergence of artificial satellites, similarly to the previous emergence of aircraft, posed the necessity of regulating the position of the cosmos. In the early days of space exploration, Soviet doctrine and practice ordinarily held that there are no existing rules for the Cosmos at present.¹ Therefore, the rules of the airspace cannot be applied to the cosmos, which is quite understandable since both environments differ drastically and are regulated by special legal regimes. Manifesting both air law and space law in practice as separate legal regimes, still does not guarantee the international community regarding its delimitation. And while this is usually perceived from the aspect of civil aviation, on the other hand, the practical application of military aviation is even more difficult to define, as well as differentiate from civil aviation, which is simultaneously one of the main purposes of this paper. For that reason, scientific and legal issues concerning a precisely defined delimitation of where airspace ends and outer space should focus on the application of theories with the purpose to attempt to define the limitation of the concept of air space, even though the delimitation of the atmosphere itself may represent difficulties originating from various factors and circumstances, all due to the additionally arisen complexity of absence of clarity.

LIMITATION OF THE CONCEPT OF AIR SPACE REGARDING STATE SOVEREIGNTY

Throughout history, the dependence of man regarding the acknowledged geographical and physical space of our planet has been manifested by his attempts to study and research

¹ This is prior to the emergence of the 1976 Outer Space Treaty. National doctrines and practice could not be regarded as potential sources of space law. In fact, the original sources of space law during the early period of space exploration were based upon scientific and technological progress and discoveries.

the various environmental planetary “spheres” in order to complement his optimal utilization and government. What derives from this sort of understanding is how a certain geographical area is perceived to have a relevant impact upon implications concerning military, political and economic needs. In order for us to determine the reference of the term “*air space*”, it is necessary to primarily to take into consideration the various interpretations of the supposed sovereignty, since state sovereignty over outer space is generally prohibited. In other words, the point at issue is whether the air space should be deemed to extend to infinity or whether it must be regarded as being limited. (Honig 1956)

When it comes to the first assumption - air space being infinite, the notorious, yet antique principle of common law *Cujus est solum ejus est usque ad coelum* - (Latin for “whoever’s is the soil, it is theirs all the way to Heaven and all the way to Hell”) can serve as a background of legal analysis for the application method, or rather the lack of application method concerning the definition of the concept of air space. This rule worked well enough for centuries because it only came up when, say, someone built a structure or owned a tree that overhung someone else’s land, or when someone provocatively held his arm over his neighbor’s fence. With the dawn of flight, though, the old rule became problematic. (Mises 2011)

While the *Ad Coelum* doctrine may not be perceived as practical, still that does not mean that its legal utilization has come to a complete end – this principle in modern law can still be applicable, although quite limited. However, with the emergence of air and space travel, and regarding the concept of air space, along with that, this principle is undoubtedly deemed unfavorable. Namely, it contains many non-practical issues of state sovereignty; Since the title to land was recognized by the sovereign, it followed logically that the sovereign who recognized private title to the land and the sky above it had jurisdiction not only over the land within his realm, but also over the air above it *ad infinitum*. Thus sovereignty was considered to be without vertical limit. (Gangale 2018)

Complementary to this statement, it can be presumed that the application of this principle to regarding military aviation is equal to civil aviation, where the nature and purpose of the aircraft is not sufficient to result in state sovereignty alternations and exceptions. This can be additionally explained by one of the major differences between air law and space law. Namely, states tend to enjoy “complete and exclusive sovereignty” over their territorial air space, while state sovereignty over outer space is prohibited by law, as appropriately stated in Article II of the Outer Space Treaty:

“Outer Space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means” (Outer Space Treaty 1967)

Therefore, if it is presumed that state sovereignty extends to infinity, which also includes outer space it cannot be legally possible for a certain state to exercise its sovereignty in space, as it does within the limits of its air space. This leads us to the analysis of the other point at issue which presumes the limitation of the air space represents a more plausible concept, even though it also contains multiple difficulties, but not as much as the previously discussed principle. This is due to the fact that their differences are derived from contrasting backgrounds and timelines which manifested unassociated technological developments regarding air travel and space travel – the *Ad Coelum* doctrine was primarily suitable as

a principle utilized in basic property law regulations, while the limitation of the air space is considered as more complicated due to the structure of the atmosphere itself. However, in terms of the recognition of state sovereignty, the existence of the concept of air space being limited is guaranteed. Furthermore, the near-space environment seems to represent an additional difficulty because of its “complicated” mergence into interplanetary space, thus being impossible to specifically determine at what altitude does the air completely disappears. Military doctrine, however, cannot be only regarded from a geographical point of view, but also from a legal standpoint. The distance at which the gravitational attraction of the earth in relation to the sun in zero might well be calculated for a certain place inside an imaginary sphere enclosing the earth at that distance could be then designated as the air space. This would have to be internationally agreed upon. But a purely scientifically determined boundary, one which is fixed by nature, will never lead to a solution of practical value. (Honig 1956)

This would mean that any boundaries or spherical limitations, perceived from a legal standpoint, are arbitrary, which leads us to the notion of the 100-km altitude, ever since named the “*Karman Line*”² came, thus into existence as the boundary separating Aeronautics and Astronautics. (Fédération Aéronautique Internationale 2004)

Concerning its adoption regarding international standards, the Karman Line holds a great deal of importance for legal measures, although its nature can still be described as arbitrary – as aircraft and spacecraft are regulated by contrasting treaties and are simultaneously subjected to fall under different jurisdictions. In other words, with reference to spaceplane activities included in suborbital flights, the legal utilization of the Karman line as an attempt to define a boundary is autocratic and unrestrained in relation of any authority derived from state sovereignty.

Freedom of overflight is another limitation. The legal status of the near-space regime is a gray area that is not directly directed addressed by treaty or policy. Near-space is not a new legal regime; the question is only whether it falls under air law, where nations claim sovereignty, or space law, where overflight rights exist. Due to the lack of clear legal precedent governing the near-space regime, there is considerable disagreement over whether overflight rights exist. (Wang 2011)

DEFINING THE NEAR-SPACE ENVIRONMENT WITHIN THE ATMOSPHERIC STRATIFICATION – A GEOPOLITICAL APPROACH

The composition of Earth’s atmosphere represents a layer of gases, retained by Earth’s gravity. Although *air*³ is the general term that is used to generally describe the composition of Earth’s atmosphere, the system of formation of these various layers of gas allows the practice of atmospheric stratification, since Earth’s atmosphere does not end abruptly at

² The Karman Line is appropriately named after Theodor von Karman (1881-1963), who successfully managed to calculate the altitude at which Earth’s atmosphere becomes too thin to support aeronautic flights.

³ Clear gas in which allows for living things, including human beings, to breath and live properly. It is known to have no color, odor, shape, or volume. However, it has weight and mass.

any given attitude. The notion of atmospheric stratification is theoretically utilized due to the fact that density and air pressure gradually decrease with altitude in the atmosphere. Distinguishing atmospheric layers is primarily done by a classification regarding altitude. The Earth's atmosphere has four primary layers:

- * The Troposphere: 0-10 Miles
- * The Stratosphere: 10-31 Miles
- * The Mesosphere: 31-51 Miles
- * The Thermosphere: 53-375 Miles (NASA 2013)

This rather neutral and objective characteristic of natural background tends to negatively reflect upon the delimitation between airspace and outer space, regarding both aspects of law and engineering. Additionally, due to the Exosphere being represents the upper limit of Earth's atmosphere and simultaneously containing most of the satellites orbiting Earth, its excluding from the atmospheric stratification can be noted due to the fact that it does not represent the near-space environment.

Respectively towards the atmospheric and legal position of the near-space environment, the simultaneous issue upon the delimitation of airspace and outer space has contributed for the arising of many approaches, theories and ideologies. There have been two primary schools of thought with regards to this issue:

1. the *functionalist approach*, which maintains that the nature of the activity rather than the location of the activity should be the determinant; and
2. the *spatialist approach*, which proposes setting a measurable physical boundary.

The problem with the functionalist approach, however, is the assumption that objective assessments can be made regarding which activities qualify as air or space activities. The problem worsens as new and emerging technologies pose new ambiguities. Near space, the primary area in question, falls between approximately 20 and 200 kilometers, and is a range in which a variety of emerging activities are likely to take place. (DiPaolo 2014)

Nevertheless, both approaches do not seem to do any justice regarding the near-space environment and military spaceplane operations within that atmospheric zone. Namely, spatialism tends the acknowledgement of a fixed line of physical nature – a settlement of altitude, which is impossible to measure in a precise manner due to the air being rarified to the point where it is no longer existent. On the other hand, functionalism presumes that if any type of aircraft is in question, air law applies and in contrast, if the certain vehicle in question has the purpose to conduct activities in outer space, then space law applies. Therefore, the emergence of aerospace vehicles – such as spaceplanes – which have the capacity to operate both as an aircraft and a spacecraft, pose as an inconsistent type of vehicles that can be subjected to either existing legal regimes. Furthermore, the reference of the near-space environment could be presumed to be treated as an intermediate region. However, it might be possible for the root of this issue to be properly analyzed by a geopolitical approach with the posing of two concepts: Geopolitics of Airspace vs. Astropolitics, in connection with military purposes and strategies. At the heart of any serious geopolitical analysis is

the question of the power and borders of states that in any final instance are enforced by military power. (Bergesen 2018)

Increasing dynamics of technological advances and development is what primarily inspires the ongoing progress in the ultimate use of air force, thus setting a claim of superiority of aviation power by the geopolitics of airspace – emphasizing discoveries with reference to air attack capabilities and weaponry; Since the beginning of the history of aviation, the use of aircraft for military purposes revealed an efficient and dangerous weapon in the arsenal of a State. First it was used as observatory post, and then the aircraft took a more active role in combat until it became a destructive and deadly weapon. The definition of military aircraft in international law is not clear as States only wish to regulate international civil air navigation and not state aircraft. On the other hand, the Law of armed conflict defines the status of every aircraft with their respective duties and rights in the conduct of hostilities. (Tremblay 2003)

However, it is more complicated to pin military purposes in the domain of outer space, since its legal regime – space law, since in geo-strategy and geopolitics the utilization of outer space is primarily oriented toward scientific research, maintaining telecommunications, navigation and navigation systems, intelligence and reconnaissance, i.e. gathering information on the conditions and deployment of ground forces for strategic purposes, cartographic and meteorological data for peaceful purposes and for the general use of mankind. In fact, low-Earth orbit positioned satellites can be easily used for espionage, particularly through satellite images of the positions of military units and terrorist groups often carry out military attacks. This being said, it could be concluded that potentially emerging military spaceplane operations do not possess strictly defined characteristics that would allow them to be a part of either the geopolitics of airspace, or even more likely as a part of astropolitics. In other words, the military utilization of spaceplanes in regards to the general notion of geopolitics needs to be properly analyzed, as it would be quite convincing to follow the same issues as the question of the delimitation of the near-space environment. Consequently, if we presume the establishment of a newly founded concept or theory of geopolitics – “*Geopolitics of Near-Space*”, it should be able to establish, support and implement the military-security capabilities and strengths of States based on the atmospheric location of their hybrid – aerospace vehicles – operating in the near-space environment. The understanding of governing forces that would provide for the development of geopolitics as a scientific discipline in order to conceptualize the study and explanation of the distinguishing characteristics and features of military spaceplanes, as well as the region of the near-space environment and its implications.

THE POTENTIAL OF NEAR-SPACE FOR MILITARY SPACEPLANE OPERATIONS

Scientists, legislators, military personnel, politicians, academics and even ordinary civilians often develop and manifest tendencies towards a fixed mindset regarding the notion of outer space as a specific location (although the term itself can be extremely

vague). They perceive a multitude of possibilities for its ultimate utilization – during both peacetime and wartime. On the other hand, it is necessary to realize the potential of the near-space environment for the application of military aerospace operations via spaceplanes. In fact, battlespace awareness at an operational level has always includes military spaceplanes and thus guarantees these military characteristics to be more prominent in the future. Unlike reusable space vehicles designed for commercial or scientific applications, a military spaceplane would complete missions including transportation, force projection, reconnaissance, and deployment of space assets supporting the strategic and tactical goals of theater commanders. Reliable access to space will drastically change how military goals are achieved. (Rothermel 1997)

Manifestations of hostile behavior between countries, such as engaging into combat, is characteristic regarding the state of belligerency between two or more entities – sovereign states. As such, international law guarantees for belligerent nations to invoke the right of self-defense under Article 51 of the United Nations Charter:

“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. Measures taken by Members in the exercise of this right of self-defence shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.” (United Nations Charter 1945)

Still, this international right cannot provide us with an appropriate answer regarding the arising question: *How is the near-space environment utilized and legally regulated during wartime?* Nonetheless, it is believed that near-space has been a cultural blind spot – too high up for an aircraft, but too low for satellites. (Tomme 2012)

The usage of the term “*cultural*” does not seem to exactly define the access of near-space as a type of a military zone from a global standpoint, but rather manifests a “privilege”, usually that of a superpower like the U.S. to conduct various military operations. In other words, the near-space being referred to as a cultural blind spot only emphasizes the relation to the military behavior of a specific society or nation to conduct power superiority, dominance and control. Instead, the near-space environment should be analyzed to be able to support its representation as an *international* blind spot, meaning that military forces of numerous sovereign states which possess the scientific and technological advancements of military spaceplanes, should be able to utilize the near-space environment. Of course, this simultaneously includes various operations during peacetime as well, especially of commercial, scientific or transport background. However, international law has the purpose of discovering why the near-space environment is referred to as a blind spot in the first place. Namely, due to its seemingly combined atmospheric features of both airspace and outer space, the near-space environment, which is also regarded as the mesosphere, is not yet properly regulated in terms of military application. The lack of legislation, therefore, allows for sovereign states to perform military operations above their airspace and even above the airspace of another state, often without permission or acknowledgement.

Another potential likelihood, however, is for near-space to be considered as a military no-fly zone during wartime. Being terminologically comparable to a military exclusion zone (MEZ), no-fly zones, as a modern phenomenon, represent a segment of airspace established by military power, where certain aircrafts are not allowed to fly, specifically during wartime. During armed conflict, the establishment of an exclusion or no-fly zone is governed by international humanitarian law and other applicable rules of international law. The extent, location, and duration of the zone, and enforcement measures, are limited to those required by military necessity or the need to safeguard protected persons and objects. (Gill and Fleck 2010)

As mentioned, no-fly zones are characteristic in practice for being applicable regarding to airspace. However, the near-space environment being included within aerospace is still not properly regulated regarding military utilization, but that does not serve as an exclusion from the possibility of it being regarded as a no-fly zone during wartime. Furthermore, as they are not established in international airspace, the establishment of no-fly zones by a belligerent over its own or enemy territory is relatively uncontroversial. (Gill and Fleck 2010)

Aerospace activity, in other words, supports multiple applications, including applications of military background. This concept alone allows for the opportunity of near-space to be associated or compared to certain “classifications” that are currently characteristic for airspace. This alludes that the near-space environment, regarding the application of military spaceplane operations, might be deemed as “*special use aerospace*”, which is already the case with airspace, and can be consisted, among other types, of a military operation area (MOA);

Even though the definition of a MOA explained as “airspace established outside Class A airspace to separate or segregate certain nonhazardous military activities from IFR Traffic and to identify for VFR traffic where these activities are conducted”, the identification of a MOA located in near-space would have certain fundamental changes, compared to the previous definition. In other words, significant atmospheric differences between airspace and aerospace as well as common presence of civilian or commercial air traffic contributes for the redefinition of near-space as an area being utilized for a similar goal for which a MOA ordinarily stands for. To illustrate, air traffic is non-existent in near-space and the only objects that primarily access near-space are balloons, sounding rockets and rocket-powered aircraft. As a result, the mesosphere is jokingly referred to as the “ignosphere” – it has always been tough for researchers to access and so has been largely ignored. (Discover 2016)

This is one of the main reasons why, unlike in airspace, a specific area in near-space identified as a MOA would not have as one of its primary purposes to separate military activities from regular air traffic. However, the terminology might not be necessary to bare any changes since the expression “military operation area” would undoubtedly clarify that a particular segment of near-space is being used for the conduct of military operations, potentially by military spaceplanes for the most part. If we hope for military spaceplanes to be present in near-space more often, then it would be necessary to develop appropriate concepts and legislation. Furthermore, since operational military doctrine includes the application of military aviation in the realm of aerial warfare, it is also important to consider

the simultaneous involvement regarding the utilization of military spaceplanes in the near-space environment. This would be achieved through the establishment of an “*Aerospace force*” in its literal meaning of location reference, with the purpose of manifesting aerospace superiority in the near-space environment in regards to one or multiple sovereign states during wartime. The already existing notion of an aerospace force, which may refer to as a military branch responsible for both air and space warfare, should not be confused with the abovementioned proposition. Namely, air and space warfare represent separate and drastically different environments that guarantee potential for military application. Since near-space is not developed enough to be familiarized with officially acknowledged military application, the term aerospace force would still represent a military branch that is capable of the manifestations of air and space warfare due to their limitation connection and atmospheric association. If we presume near-space’s future military utilization, then it would be necessary to appropriately separate three existing types of forces:

- **Air Force** (a military branch that conducts aerial warfare)
- **Aerospace Force** (a military branch that conducts aerospace warfare)
- **Space Force**⁴ (a military branch that prepares for or conducts space warfare)

Consequentially, the establishment of such a military force would automatically promote “*aerospace superiority*” – an equivalent to the general notion of air superiority. Various levels of air superiority could be used in an attempt to make a comparative application of the potential level of aerospace superiority. There are three degrees of air superiority:

- **Air Parity** – the lowest form of control, where a side only holds control of skies above friendly troop positions.
- **Air Superiority** – that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea and air forces at a given time and place without prohibitive interference by the opposing force.
- **Air Supremacy** – that degree of air superiority wherein the opposing air force is incapable of effective interference. (Royal Air Force 2013)

Identical enough, the utilization of military spaceplanes during wartime could assimilate such levels of aerospace superiority regarding its domain in the near-space environment. But in spite of this, the notion of aerospace superiority might not be able to be fully manifested due to its immediate relation to the “aerospace warfare” concept, which would still be questionable from a legal perspective. This observation is primarily triggered by the landing of the U.S. Air Force’s secret X-37 spaceplane after record-breaking 780 continuous days in orbit. Namely, the secrecy of X-37B’s military operation in orbit contributed for the development of many speculations among space experts regarding its true purpose, even though it has been officially announced by the Air Force that the military spaceplane in

⁴ Not to be confused with the United States Space Force as a strictly national military branch. The general term “Space Force” refers to various national military branches of identical purpose.

question will help to “*test experimental electronics and oscillating heat pipe technologies in the long-duration space environment.*” (The National Interest 2019)

One of the common speculations concerning X-37B is the presumption of its capacity to be loaded with satellites, which opens the possibility to also be loaded with weapons, whenever necessary. However, the Air Force denies that the X-37B has ever carried weapons. Overtly arming a spacecraft would be a violation of the 1967 Outer Space Treaty. (The National Interest 2019)

Nevertheless, if we were to put the Air Force’s X-37B military spaceplane aside, it is also of equal importance to generally analyze other potential vehicles or hybrid space objects appropriate for operating in the near-space environment for military application from the standpoint of their advantages and disadvantages. Additionally, this could indicate on what to expect in terms of advanced military spaceplane development. For instance, near-space vehicles need to be flexible, replaceable, and cost-effective, otherwise, their use may be very limited in military applications. (Wang 2011)

Correspondingly, their construction should be appropriately designed for the near-space environment. Even though these vehicles are of a hybrid nature that does not mean that they should be technologically or even legally forced to “fit in” in accordance to the already defined objects, such as spacecrafts or aircrafts, rigorously. This attempt leads to nothing more than inefficient performance as a consequence. Vehicles quickly become unmanageable for repetitive and hasty military use if we try to consistently reach high altitudes. This is perhaps why the Air Force Scientific Advisory Board recently considered near-space vehicles higher than 30 km “not viable” in the near future. However, this unfortunately leaves near-space vehicles in the altitude region that will probably make them more susceptible to enemy attack. (Wang 2011)

In respect of military spaceplanes, their exposure, comparatively to other near-space vehicles, also allows for them to be prone to enemy attack. Particularly during warfare, it would be expected for military spaceplanes to be treated as potential targets from the perspective of foreign military aircraft, as non-military aircraft tend to avoid areas where hazardous military activities are conducted. On the other hand, the design of a military near-space vehicle should not represent the only factor to be relied upon. Specific characteristics of the near-space environment, which from an objective standpoint are interpreted as neutral, could rather pose as advantages or disadvantages for the operation of military spaceplanes. In particular, the weather in near-space might be perceived as an advantage, as there are no clouds, thunderstorms, or precipitation in near-space. Although the air density in near-space is very low, wind is still an important environmental factor. Wind in near-space varies with altitude, time of year, and latitude, generally increasing with both latitude and altitude. In higher near-space there is no appreciable wind. (Wang 2011)

Consequently enough, commercial and military interests have begun to develop operating systems in near-space (at an altitude of roughly twenty to eighty kilometres). Such systems include suborbital vehicles, stratospheric balloons, pseudo-satellites and high-altitude drones. Operations in near-space are a potential threat for air traffic beneath and for the public on ground, in case of failures or malfunctions. They are also a threat for space outbound and returning traffic. (Space Legal Issues 2019)

International legislation should hold the necessity and responsibility of properly addressing the abovementioned issues in order to guarantee national and international safety. Moreover, failures and malfunctions are not the only “concerns” when it comes to the applications of military spaceplanes – not only would their purpose would be to perform military operations toward air traffic below the mesosphere, but could also pose as a newly arising and potential anti-satellite weapon, both during peacetime (toward domestic satellites) and during wartime (toward foreign satellites). This being said, the emergence of legal tools to guarantee space safety appropriately regarded to space traffic management, whether it is orbital or through aerospace.

LEGAL ANALYSIS OF THE IDENTIFICATION OF A MILITARY SPACEPLANE AS A HYBRID SPACE OBJECT

The next crucial step towards the utilization of military spaceplanes is asking how the international legal regulation will manage to appropriately identify them as recognizable and acknowledged means in warfare. Identical to aircrafts, since their immediate utilization in warfare, it has become a consequential obligation for legislators to properly regulate various types of spacecrafts as well. One way to answer the question as to which regime of law applies is to ask what type of vehicle is being considered – is it an aircraft, or a spacecraft, or an aerospace vehicle? This is the *functionalist* approach to the problem. (Jakhu et al., 2011)

Despite the functionalist approach being previously mentioned in this paper, it was also simultaneously established that it does not do any justice for spaceplanes as legal objects, nor for the near-space environment whatsoever. Namely, even though it might seem straight forward enough to differentiate aircrafts from spacecrafts and simultaneously determine whether they fall under the legal regime of air law or space law, when it comes to hybrid space objects, such as military spaceplanes, it is predominantly necessary to determine the operational concept of a spaceplane. Also, it is worth mentioning that the concept of a spaceplane does not represent something new in the scientific field. In fact it has been brought up even before the space age however, due to the lack of development spaceplanes in general and their complex nature, were not yet regarded as potential objects for operation; From the technological aspect of aircrafts, the words “all type of aircraft” are broad enough to include balloons, dirigibles, airplanes, seaplanes, helicopters, jets, gliders, etc. but would probably exclude spacecraft. (Tremblay 2003)

This broad classification mainly focuses on objects that are most appropriate for operating in airspace, irrelevant of their purpose. And since military spaceplanes operate in near-space and also have the ability to perform earth-to-orbit missions, rather than being limited only to earth-to-earth mission, it would not be ultimately suitable for them to be regarded specifically as aircrafts and be subjected to air law. On the other hand, the 1972 Liability Convention makes it even more difficult to determine whether space law could potentially apply and regulate spaceplanes as space objects, since it does not contain an explicit definition. Namely, this instrument only explains that the term “space object”

includes component parts of a space object as well as its launch vehicle and parts thereof. (Convention on International Liability for Damage Caused by Space Objects 1972)

Hence, neither air law nor space law can entirely identify them as hybrid space objects and therefore, as part of international legal regulation. Being technologically identified as aerospace vehicles, it is necessary to analyze the definition of spaceplanes from a non-theoretical standpoint: - a spaceplane is quite simply a vehicle that can fly as both an airplane in the atmosphere – generating lift from its wings – and as a spacecraft in a vacuum using rocket propulsion. No spaceplane has yet been built that can both take off and land as an ordinary plane and also travel into space. (AmericaSpace 2013)

Additionally, three successfully operational types of spaceplanes have been developed so far – the Space Shuttle, Buran and the Boeing X-37. However, in regards to military spaceplanes specifically, only the Air Force's X-37B military spaceplane is currently recognized as such. There are also certain models of spaceplanes, such as *Space Rider* and *Dream Chaser*, which are still under development and is therefore unknown whether they will be of military application in the future. Since the technological and applicative existence of military spaceplanes is acknowledged, another relevant question arises: *Can we differentiate non-military spaceplanes from military spaceplanes, speaking from a legal standpoint?*

Military aircraft must bear both nationality marking and marking as military aircraft, although the two can be combined into a distinctive single mark. The markings should be sufficiently visible from multiple angles to distinguish the military aircraft from other State aircraft and from civil aircraft. Despite the requirements that markings be visible, a number of States employ subdued or other low-visibility markings, particularly on special operations aircraft. State practice evidences no serious objection to such markings. (Gill and Fleck 2010)

By comparative legal regulation, identical requirement could be presumed for military spaceplanes, when recognized as official means of warfare. In other words, military spaceplanes could also bear national markings and markings as military spaceplanes. It points out a representation of the nationality and purpose of the vehicle. However, this requirement might not always be applicative in practice, as States do not necessarily follow these requirements. Since military spaceplanes are specifically used for special operations in near-space, it would be less likely for them to bear visible markings. But in order for these requirements to even be considered in the first place, the registration of military spaceplanes might pose a serious issue. This conclusion is essentially derived from the current problems that international law faces with regards to satellites and other space objects for military application. Namely, while registration of civil satellites has been furnished with some general details, till today, none of the Parties have described the objects as having military functions despite the fact that a large number of such objects do perform military functions as well. In some cases, the best they have done is to indicate that the space objects are for their defense establishments. Moreover, the number of registrations of space objects is declining. (Jakhu et al., 2018)

In addition to the registration issue, the Air Force's X-37B military spaceplane serves as an actual manifestation, which did not go completely unnoticed. Jonathan McDowell, an astronomer at Harvard-Smithsonian Center for Astrophysics, tweeted concerns that “top

secret (even TS/SCI) does not trump international law and treaty”. His issue is that over 90 percent of satellites are registered, and these satellite deployments with the X-37B were not reported – meaning this could be the first time that “either the USA or Russia has blatantly flouted the Convention.” (Observer 2019)

One may speculate in regards to the utilization of the 1974 Convention on registration of objects launched into outer space as a background for the registration of military spaceplanes. Some could deem this suggestion as understandable and even logical. Introduced by the UN in 1974, the convention is based on the 1967 Outer Space Treaty, which requires that all objects launched into space must be registered “to the greatest extent feasible and practicable”. (South China Morning Post 2019)

However, it may be argued about space planes being launched into “outer space”, since according to the characteristics of the near-space environment (and the term itself) implies that spaceplanes technically are not launched into outer space, which could still count as air space. Furthermore, Article II of the 1974 Convention on registration states that: “*when a space object is launched into Earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain.*” (Convention on registration of objects launched into outer space 1974)

The reference of Earth’s orbit and beyond indicates the high indications of space objects being identified as vehicles who only intend to pass through near-space, unlike spaceplanes. On the other hand, spaceplanes can be utilized for either earth-to-earth missions or earth-to-orbit mission. This operational capacity represents another factor that contributes for the lack of clarity in the identification of military spaceplanes as a type of vehicle. If a spaceplane will at all times be used for earth-to-orbit missions, and at other times for earth-to-earth missions, then the vehicle should be registered as both a space object and as an aircraft. Such dual registration has been advocated by some jurists, but is subject to criticism as being complicated and apt to lead to confusion, especially when the appropriate liability regime must be determined. (Kelly 1998)

This legal issue could only lead towards an “in-between” solution - the acknowledgement of the registration of aerospace vehicles, which would instinctively include spaceplanes for military application. This being said, the overall arguments established above lead us to the next point of reason;

CONCLUSION: THE NOTION OF “AEROSPACE LAW” – A NEW LEGAL REGIME APPLIED TO SUBORBITAL FLIGHTS FOR MILITARY APPLICATIONS

All of the arguments mentioned in this paper so far, indicate towards a betwixt proposition which should guarantee the avoidance of confusion and legal issues in general regarding the potential application of military spaceplanes. The frequent utilization of the near-space environment and the emergence of appropriate aerospace vehicles, spaceplanes in particular, manifest the need for the birth of a new legal regime as an intermediate between air law and space law. Both the existing regimes of air law and space law were developed at a time

when the technology for Earth-to-Earth aerospace movements did not exist yet. Thus, there is not yet a unified or integrated regime of aerospace law, and there appears to be much overlap and inconsistency between the regimes of air law and space law. (Jakhu et al., 2011)

It would be highly unpractical for space law to apply regarding military spaceplanes, as their ultimate purpose does not contain performing any missions strictly in outer space whatsoever. An identical perspective of impracticability can be pointed out in terms of air law, since military spaceplanes are designed to predominantly operate in near-space, rather than air space. But, the extant legal regimes present just a binary option: only airspace or outer space law can apply; there is presently no established regime for aerospace vehicles. The existing theories provide no definite or universal guidance for the operation of aerospace vehicles, particularly in the gray area between air and space law. (Space Legal Issues 2019)

There have been numerous attempts to legally define the near-space environment in theory, which are similar to the United Nations Convention on the Law of the Sea (UNCLOS) and propose to regard near-space as the region between “high seas” and “territorial seas”. Still, the emergence of the aerospace region legally recognized and regulated an intermediate zone would be necessary, as military spaceplanes would not be the only vehicles performing suborbital flights. Commercial and military interests have begun to develop operating systems in Near-Space. Such systems include suborbital vehicles, stratospheric balloons, pseudo-satellites and high-altitude drones. Some will operate a few minutes, hours, weeks, months, or years. (Dempsey and Manoli 2018)

The security concerns of states as regards the lack of a boundary certainly could be magnified by the advent of spaceplanes. These hypersonic vehicles could be used to rapidly enter another state’s territory to conduct surveillance or other military operations without permission from the state to do so. Likewise, the fears that spaceplanes could be used by some states to rapidly overfly another state’s territory without authorization are valid. However, a boundary between airspace and outer space would neither prevent these types of activities from occurring nor render them any more unauthorized than they already are. (Kelly 1998)

The concept of a boundary would indicate the existence of an imaginary line, as referred to the infamous Karman Line, with the purpose of attempting to mark the limits of the separate areas of airspace and outer space, when the atmospheric structure itself implies that there should be an intermediate zone. Furthermore, as there is great potential for military spaceplane operations to become more and more frequent in practice, their rigorous aerospace positioning in the near-space environment should create the necessity to not only regulate military application during peacetime and wartime, but to also ensure specific rules of liability, safety, and more importantly, space traffic management. This aspect of space safety concerns both orbital and aerospace safety. Accordingly, the capability of military spaceplanes to perform earth-to-earth and earth-to-orbit operations, allows for space traffic management to further develop advanced legal tools for the regulation of suborbital flights for military application.

BIBLIOGRAPHY

AmericaSpace. *A Brief History of Spaceplanes*. Available at: <https://www.americaspace.com/2013/06/10/a-brief-history-of-spaceplanes/> (accessed 4 January 2020)

Bergesen, A. (2018) "From Geopolitics to Astropolitics". In: Bergesen, A., Suter, C. (ed.) *The Return of Geopolitics*. Zweigniederlassung Zürich: Lit Verlag, p.169

Convention on International Liability for Damage Caused by Space Objects, 1972

Convention on Registration of Objects Launched into Outer Space, 1974

Dempsey, P. S. and Manoli, M. (2018) "Suborbital Flights and the Delimitation of Air Space Vis-à-vis Outer Space: Functionalism, Spatialism and State Sovereignty". *Annals of Air and Space Law*, vol. XLII, p. 235

DiPaolo, A.J., 2014, 'The Definition and Delimitation of Outer Space: The Present Need to Determine where "Space Activities" Begin?', *Annals of Air and Space Law*, vol. XXXIX, pp.628-629

Discover. *Reusable Rockets Set to Explore the 'Ignorosphere'*. Available at: <https://www.discovermagazine.com/technology/reusable-rockets-set-to-explore-the-ignorosphere> (accessed 22 February 2020)

Fédération Aéronautique Internationale. *Presentation of the Karman separation line, used as the boundary separating Aeronautics and Astronautics*. Available at: <https://web.archive.org/web/20110809093537/http://www.fai.org/astronautics/100km.asp> (accessed 18 February 2020)

Gangale, T. (2018) *How High the Sky?: The Definition and Delimitation of Outer Space and Territorial Airspace in International Law*. Leiden, Netherlands: Brill Nijhoff

Gill, T.D. and Fleck, D. (2010) *The Handbook of the International Law of Military Operations*. NY, United States: Oxford University Press

Honig, J. (1956) *The Legal Status of Aircraft*. Dordrecht, Netherlands: Springer Netherlands

Jakhu, R.S., Jasani, B. and McDowell, J.C. (2018) "Critical Issues Related to Registration of Space Objects and Transparency of Space Activities". *Acta Astronautica* 143: 406.

Jakhu, R.S., Sgobba, T. and Dempsey, P.S. (2011) *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?*. Heidelberg, Germany: Springer-Verlag Wien

Kelly, E., 1998. *The Spaceplane: The Catalyst for Resolution of the Boundary and 'Space Object' Issues in the Law of Outer Space?*, Master's Thesis, McGill University, Montreal

Mises Daily Articles 2011, *Who Owns The Sky?*, 18 April 2011. Available at: <https://mises.org/library/who-owns-sky-0> (accessed 17 February 2020)

NASA. *Earth's Upper Atmosphere*. Available at: https://www.nasa.gov/mission_pages/sunearth/science/mos-upper-atmosphere.html (accessed 5 January 2020)

Observer. *Secret Military Spaceplane Lands After Record-Breaking 780 Days in Orbit*. Available at: <https://observer.com/2019/10/secret-air-force-spaceplane-x37b-record-breaking-orbit/> (accessed 20 February 2020)

Outer Space Treaty 1967

Rothermel, S.A. 1997. 'Architecture, Design, and Implementation of a Rapidly Prototyped Virtual Environment for a Military Spaceplane', Master's Thesis, Air Force Institute of Technology, Ohio

Royal Air Force. *Air Power Definitions and Terms*. Available at: https://web.archive.org/web/20130928003407/http://www.raf.mod.uk/rafcms/mediafiles/374F7380_1143_EC82_2E436D317C547F5B.pdf (accessed 22 February 2020)

South China Morning Post. *Does US space plane X-37B mark start of new military frontier?*. Available at: <https://www.scmp.com/news/china/military/article/3035417/does-us-space-plane-x-37b-mark-start-new-military-frontier> (accessed 22 February 2020)

Space Legal Issues. *The Delimitation between Airspace and Outer Space*. Available at: <https://www.spacelegalissues.com/the-delimitation-between-airspace-and-outer-space/> (accessed 18 February 2020)

Tomme, E.B. (2012) *The Paradigm Shift to Effects-Based Space: Near-Space as a Combat Space Effects Enabler*. Maxwell AFB, Alabama: Airpower Research Institute

The National Interest. *The U.S. Air Force's Secret X-37B Space Plane: A War Machine?*. Available at: <https://nationalinterest.org/blog/buzz/us-air-forces-secret-x-37b-space-plane-war-machine-69861> (accessed 22 February 2020)

Tremblay M (2003) *The Legal Status of Military Aircraft in International Law*. Montreal, Canada: Library and Archives Canada

United Nations Charter 1945

Wang W (2011) *Near-Space Remote Sensing: Potential and Challenges*. Heidelberg, Germany: Springer-Verlag

