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Astropolitics: Yes, That is Really a Thing

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Abstract: The paper reviews the main approaches towards the study of the geopolitics of outer space and presents some main issues to be tackled in the future. Geopolitics, as an approach towards the analysis of international politics, generally discusses the impact of geography on the political processes. Throughout history, approaches to analyse the impact of different types of terrain or different types of environment (sea, air, land) on the conduct of political activity were developed. It was only in the 1990s when Everett Dolman applied the geopolitical approach to the outer space domain. Since then, many approaches to the issue were developed, and the stream known as astropolitics became an important stream of academic thought. The author analyses some physical characteristics necessary for the understanding of the domain's mechanisms and then presents some important streams of thought inside the geopolitical thinking. The analysis focuses on the issues of actorness, the relations between space powers, technological progress, the introduction of space weapons, utilisation of natural resources, and sustainability of space operations. The author concludes that with foreseeable technological progress in the future, the outer space domain will become more relevant for both academia and practitioners in their approach to international politics, requiring deeper understanding of how processes in this domain can impact political events and relations.

Key words: outer space, geopolitics, power projection, space environment, astropolitics, technology, security.

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Geopolitics as a discipline dates back to the 19th century and Sir Harold Mackinder's thinking about the interaction between the land and sea powers. Since then, many schools of thought on geopolitics spanning through other domains appeared. Academicians are generally well aware of the geopolitical analysis of the high seas through the presence of the sea lines of communication and de Severski's zone of decision that introduced the air as a domain of geopolitical analysis as well.[2] Streams from classical to critical to anti-geopolitics appeared with specific geographical schools (Anglo-Saxon, German, French, etc.).[3] For much of the 20th century, nonetheless, it seemed as if one of the strategic environments would be different, with other theoretical principles guiding the political interactions taking place in it – outer space.

Despite the fact that since the beginning of the space age in 1957, the activities were generally guided by the military thinking, outer space had a unique aura of global co-operation – a space to define the future peaceful destiny of mankind. This line of thought is clearly present in the normative framework developed for this environment and manifested mainly in the so-called Outer Space Treaty ratified in 1967. Outer space was to become the province of all mankind that would be utilised for the benefit of the whole humanity and with respect to the needs of future generations. Outer space was to become the region used for peaceful purposes. In practical terms, however, the situation much more resembled the conflicting relations determining the terrestrial power distribution rather than the idealized state of affairs present in many of the documents.

This issue connected to the geopolitical level of analysis was brought into the academic attention no later than in the 1990s with the famous Dolman's *Astropolitik* bringing many controversies.[4] Since this era, we can identify several streams in the geopolitical thinking about the domain that has allowed us to spot the similarities as well as differences in the analysis of other strategic domains. The following article first covers some physical characteristics necessary for the understanding of the domain's mechanisms and then presents some important streams of thought inside the geopolitical thinking that can help the reader navigate through the different approaches to the analysis of the

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[2] See Alexander de Seversky, *Air Power: Key to Survival*, Simon and Schuster, New York, 1950.

[3] For a basic overview see Gearóid Ó Tuathail, Simon Dalby and Paul Routledge, *The Geopolitics Reader*, Routledge, London and New York, 1998.

[4] Everett C. Dolman, *Astropolitik: Classical geopolitics in the space age*, Frank Cass Publishers, London, 2005.

domain. Finally, the article presents some critical questions for the future of the geopolitical landscape beyond the atmosphere.

Outer space as a strategic domain

It comes as no surprise that using the geopolitical analysis, we can understand the domain in the centre of this analysis as a strategic (an independent war-fighting domain) or operational (an active area of operations) domain. On the one hand, this domain holds its specifics that affect the thinking related to the interactions among the space powers and other actors. On the other, it is interconnected with other environments, mutually affecting the activities taking place inside them. The physical nature, in this case, establishes quite clear boundaries to the nature of operations that the humankind is currently capable of conducting. In this case, the level of technological progress is still rather low, and the technology used is very rudimentary. So, any activity in outer space has been determined by the level of technological sophistication since without proper technologies humans cannot conduct any missions.

There are many specifics connected to the physical nature of the outer space environment.[5] First, we must mention the hazards that the technology must sustain, and astronauts need to be protected against. Numerous issues can be raised, but arguably the most important are the following: the presence of a free-fall environment, vacuum, radiation, collision hazards, and atmospheric effects.[6] The free-fall environment presents a risk to the humans operating in it since the specific conditions have many health effects on the astronauts' bodies. It also affects the ability to manoeuvre. Besides presenting a threat to living beings, the vacuum may additionally pose a risk to the technology. If the probe is holding any trapped air inside its construction, this air will violently escape into the vacuum, thus endangering the integrity of the asset's construction.

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[5] For a more in-depth analysis, see Everett C. Dolman, *Astropolitik: Classical geopolitics in the space age*, op. cit., pp. 52–73; Bohumil Doboš, *Geopolitics of the Outer Space: A European Perspective*, Springer, Cham, 2018, pp. 7–30.

[6] Martin E. B. France and Jerry Jon Selers, "Real Constraints on Spacepower", in: Charles D. Lutes and Peter L. Hays (eds), *Toward a Theory of Spacepower: Selected Essays*, Institute for National Strategic Studies, National Defense University Press, Washington D.C., 2011, p. 68.

[7] Everett C. Dolman, "Geostrategy in the space age: An astropolitical analysis", *Journal of Strategic Studies*, Vol. 22, No. 2–3, 1999, pp. 83–84.

Radiation – either based on light particles emitted from the Sun, or on heavy particles in the form of galactic radiation – also threatens both the health and lives of astronauts and the working of the assets. While the surface and the closest vicinity of our planet are to a degree protected by the Earth's magnetic field, places outside of this sphere are directly affected by the flow of charged particles. This creates well-known dangers for human beings but also threatens the electrical circuits and other computer technology on board of the probes. The collision hazards are connected to a lesser degree to the possible negative interaction between any asset and a micrometeorite, and to a more significant degree, to the issue of space debris orbiting our planet. Last but not least, the atmospheric effects include the corrosive effects of the atomic oxygen present in the upper layers of the atmosphere, and the pull of the remains of the atmosphere slows down the assets, thus de-orbiting them. This is very useful as a solution to the orbital debris issue but presents a significant challenge for the operational assets.

Other key specific lies in the central importance of gravity. First of all, the gravitational pull of the Earth strictly limits our current ability to reach outer space, and the attempts to exit the gravitational well of our planet are extremely expensive. Additionally, the gravitational effects of the celestial bodies establish a form of geography that affects the movement in the domain. The effects of gravity with their changes concerning the mass and distance from the object establish a form of "topography" that affects the movement in the region and the need for energy expenditure for movement.[7] These effects are, for example, responsible for the fact that the orbital movement is the most efficient type of movement possible. Once an object reaches the stable orbit, it can theoretically, given that no other forces are involved, remain in such an orbit indefinitely. Practically speaking, the satellites in the Earth's orbits remain there without the need to spend any fuel for decades on lower orbits and hundreds of years farther from the surface. Objects in orbits are, on the one hand, stable and not requiring any manoeuvres, thus saving propellant that is expensive and limited, but their position is also predictable as they return to the same locations in the precisely given periods.

Speaking of this, we can identify several specific types of orbits that are useful and utilised for different purposes. There are three basic sets of orbits – low (approximately 150–800km), medium (800–35,000km), and high (further than 35,000km above the average sea level), all located over the Equator.[8]

[8] Ibid., pp. 87–89. Martin E. B. France and Jerry Jon Sellers, "Real Constraints on Spacepower", op. cit., p. 73.

Additionally, we can find specific orbits that serve specific purposes. Polar orbits are often used. Highly elliptical orbits allow the satellite to spend a disproportionately longer amount of its orbital period over one part of the globe (e.g., the Artic) than the other and can be used for communication with or reconnaissance of one of the polar regions over the other. Sun-synchronous orbits allow the spacecraft to revisit the same geographic region in the same light conditions improving photoreconnaissance capabilities. A geosynchronous orbit allows the spacecraft to orbit the Earth at the same time-period as the Earth rotates and a geostationary orbit, using the same principle, allows the spacecraft to stay over the same geographic region throughout the entire orbital period. This type of orbit is located directly over the Equator at approximately 35,786km. It, however, cannot be used for the monitoring of the polar regions that are "behind the horizon". The majority of activities is taking place on low orbits. However, for example, the important navigational constellations (like GPS, GLONASS, or Galileo) are located in the medium Earth orbits. If we are to summarize the essential environmental specifics of the region, we have to name the specific hazards, the key influence of gravitational effects, and the limited manoeuvrability of the currently used spacecraft.[9] Additionally, we can observe several specific regions appearing in the accessible part of the space. While these are sometimes brought as analogies to, let us say "Mahanian" type of analysis like in Dolman's works, the use of analogies in the analysis of outer space might be misleading, and these should be understood in their own quality.[10] Lagrange Libration Points – as the location in which an object can, with little to none expenditure of energy, remain in relatively the same position towards two objects – or Van Allen radiation belts – creating regions with a higher level of radiation due to the capturing of the highly charged particles by the magnetic field – present additional examples of the physical features setting up a complex "geographic" characteristic of the domain.[11]

[9] Bohumil Doboš, *Geopolitics of the Outer Space: A European Perspective*, op. cit., pp. 7–30.

[10] Elizabeth Mendehall, "Treating Outer Space Like a Place: A Case for Rejecting Other Domain Analogies", *Astropolitics*, Vol. 16, No. 2, 2018, pp. 97–118.

[11] Everett C. Dolman, *Astropolitik: Classical geopolitics in the space age*, op. cit., pp. 52–73; Bohumil Doboš, *Geopolitics of the Outer Space: A European Perspective*, op. cit., pp. 7–30.

Astropolitics

Any overview covering geopolitical thinking on outer space must begin with Everett Dolman. Dolman, in his two seminal works on the topic – an article and a book on the same topic – applies the classical approach to the analysis of political space inside the outer space environment.[12] He states that the domain does not present the humankind with any new choices to make. The available and often utilised analysis of the political processes is applicable to the domain as it is in no manner different from the other spaces penetrated by the human activity. This includes the presence of conflict that will clearly enter the area as has happened in the past with other newly utilised spaces. For this reason, developing a strategic approach to the domain is wise.

Dolman operates with the classical geopolitical analysis strongly rooted in the thinking of Halford MacKinder. He presents the basic principles of astrophysics and sets up a terrain that allows us to identify key choke points and in general, develop an astrostrategy similar to the military approach to terrestrial operations. In this sense, the key choke points include some selected orbits, celestial bodies, Lagrange Libration Points (regions in which gravitational pull of two bodies cancels each other out), and so on. He, furthermore, stresses the importance of ultimate high ground for the military as the capture of orbits would allow the selected actor to dominate the terrestrial battlefield from the unchallenged high perspective. In his work, Dolman develops four regions into which the currently utilised part of outer space can be divided – 1) the Earth (or *Terra*), 2) the Earth space (up to the geostationary orbit), 3) the Lunar space (from geostationary orbit to just beyond lunar orbit), 4) the Solar space (beyond lunar orbit). In any sense, the control of the Earth remains the ultimate target of any space operations. By such a division, Dolman can further operate with the Heartland theory and then apply it to the studied domain. Instead of

> Who rules East Europe commands the Heartland.
>
> Who rules the Heartland commands the World-Island.
>
> Who rules the World-Island commands the World.[13]

Dolman develops an adequate reflection for space politics in

> Who controls the low-Earth orbit controls the near-Earth space.

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[12] Everett C. Dolman, "Geostrategy in the space age: An astropolitical analysis", op. cit., pp. 83–106; Everett C. Dolman, *Astropolitik: Classical geopolitics in the space age*, op. cit.

[13] Halford J. MacKinder, *Democratic Ideals and Reality*, National Defence University Press, Washington D.C., 1942, p. 106.

Who controls the near-Earth space dominates *Terra*.

Who dominates *Terra* determines the destiny of humankind.[14]

As a reaction to this, Dolman theorises that the first power to dominate the low Earth orbits will gain effective control not only of outer space but of the Earth as well. In this sense, it is vital to develop technologies that overcome the inherent predictability and destructibility of the space assets to present efficient space technologies that will allow an actor to reach this level of control. As for Dolman, the power to attain such dominance and hegemony should be the United States as the "liberal hegemon". He predicts that any other actor would much more readily misuse the position. However, the United States would set up a *Pax Americana* that would enable other actors to operate in the domain under U.S. guidance. As this development is natural for Dolman, the U.S. policymakers should invest in the development of capabilities that will allow them to dominate the domain before the others do.

Such a view was directly challenged by many authors covering more critical approaches to the study of international politics.[15] The line of thought basically follows more normative and ethical approaches to international relations and geopolitics. Here, the essay by Havercroft and Duvall will be presented as an example of such a point of view.[16] The authors draw on the background of interpretative streams of thought in order to present an alternative to more traditionalist approaches to the analysis and Dolman's perspective in particular. They oppose the call towards the US-led weaponization of the orbital space that should lead to the introduction of the hegemony over the domain. Such a hegemony would not only necessarily lead to peaceful development – the United States can be restrictive – but would actually prevent the sovereign decision-making of other states. They additionally criticise the lack of moral and political implications of such a call in the Dolman's work. The essay draws attention towards issues like counterbalancing, resistance to the hegemon, and the inability of the majority of the population to affect their destiny in outer space. The essay thus presents more of a normative than technological resistance to the ideas of *Astropolitik*.

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[14] Everett C. Dolman, *Astropolitik: Classical geopolitics in the space age*, op. cit., pp. 6–7.

[15] See also the discussion in Nikola Schmidt (ed.), *Planetary Defense: Global Collaboration for Defending Earth from Asteroids and Comets*, Springer, Cham, 2019.

[16] Jonathan Havercroft and Raymond Duvall, "Critical Astropolitics: The geopolitics of space control and the transformation of state sovereignty", in: Natalie Bormann and Michael Sheehan (eds), *Securing Outer Space*, Routledge, New York, 2009, pp. 42–59.

Even a more radical approach is presented by the stream of anti-geopolitics. One of the authors dealing with the issue is MacDonald.[17] The anti-geopolitical stream is focused on negating the geopolitical perspective altogether as imperialist. The school of thought promotes the normative approach to the study of international relations aiming at promoting co-operation and limiting conflict in international affairs. Geopolitics, in this sense, is not a neutral tool for the analysis of the foreign policy, but a guideline to imperium-building. More specifically, the case of anti-astropolitics is promoting the banning of any military activity in the domain as it should be understood as a sanctuary utilised for peaceful, meaning non-military purposes only. This way the international co-operation can be started and later replicated in other domains. Outer space thus presents a unique case whose pristine nature should not be spoiled by the terrestrial conflicts.

Analysing the literature, we can also identify a realist stream of thought standing somewhere between these positions – not being primarily normative but negating the radical ideas on the inevitability of conflict over the dominance presented by classical geopolitical perspective. This stream is probably the best represented by Wang's work.[18] The author challenges the notion that outer space establishes an entirely novel type of environment defined by a cooperative nature of relations. He claims that the nature of the relations mirrors the relationship of the powers on the Earth with the exception of decreasing the confrontation and increasing co-operation as a result of technological and economic limitations connected to spaceflight. He tests his hypothesis on a case of transatlantic relations that should be the most co-operative of any dyad inside the space community. In the case studies, it is presented where the tensions, even between such close actors as the United States and Europe, appeared. Thus, the notion of a special nature of space politics is dismissed. The relations thus follow the interest of the space powers on the ground but are restrained by the technological, environmental, and economic factors. Outer space is not a unique cooperative domain, but the inevitability of conflict might be limited by the technological progress – all tied to the terrestrial geopolitics.

Another approach observable in the geopolitical literature is stemming from the systematic analysis of political space. In this sense, we can identify two works

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[17] Fraser MacDonald, "Anti-*Astropolitik* – outer space and the orbit of geography", *Progress in Human Geography*, Vol. 31, No. 5, 2007, pp. 592–615.

[18] Sheng-Chih Wang, "The Making of New 'Space': Cases of Transatlantic Astropolitics", *Geopolitics*, Vol. 14, No. 3, 2009, pp. 433–461; Sheng-Chih Wang, *Transatlantic Space Politics: Competition and cooperation above the clouds*, Routledge, Abingdon, 2013.

utilising the approach. The first is Al-Rodhan's *Meta-Geopolitics of Outer Space*.[19] The work combines an analysis of different activities that can be conducted in the domain to present a plastic picture of the geopolitical landscape of outer space. The second is Doboš' *Geopolitics of the Outer Space* utilising Gerrard Dussouy's systemic geopolitics in order to achieve the same but looking at the levels of analysis rather than concrete activities.[20] Both these works attempt to utilise geopolitics as a neutral method to analyse the political space. They also operate with the presumption that outer space is an independent geopolitical domain and should be analysed as such.

Finally, we can identify several schools of thought that, in general, focus on the nature of space politics that are not that relevant to the topic of the academic geopolitical thinking about the domain but rather for the practical implications as they often guide the policymakers' perception of outer space. As these establish the nations' policies, it is relevant to cover them briefly. Two prominent authors that developed the division into schools of thought are Moltz and Johnson-Freese. Moltz in his work distinguishes among the school of space nationalism (reflection of the realist nationalistic perspective into outer space), technological determinism (the nature of space politics is based on the nature of the technology developed (e.g., space mining capabilities vs. space weapons determine whether the actors will pursue economic or political goals), social interactionism (prevention of space weaponization through soft-law measures and trust-building mechanisms), and global institutionalism (idealist approach promoting co-operation under auspices of universal international organization).[21] Johnson-Freese establishes a similar division. She distinguishes the space dominance and ultimate high ground school (dominating of politics through military domination of orbits that allows for the control of the Earth's surface), inevitability of space weaponization school (the weapons will be introduced once technologically feasible, meaning that it is wise to be the first to introduce them), school of thought focusing on the passive military importance of the domain (pointing at the importance of arms control and weaponization prevention as a means to sustain the current benefits as weapons in space decrease the security for all including the first to introduce

[19] Nayef R. F. Al-Rodhan, Meta-Geopolitics of Outer Space: An Analysis of Space Power, Security, and Governance, London, Palgrave Macmillan, 2012.

[20] Bohumil Doboš, *Geopolitics of the Outer Space: A European Perspective*, op. cit.

[21] James Clay Moltz, *Crowded orbits: Conflict and cooperation in Space*, Columbia University Press, New York, 2014, pp. 23–40.

them), and space sanctuary school (banishing military use of the domain at all including the passive militarization).[22]

These schools of thought present possible approaches towards the understanding of the domain and events taking place in it. The distinction among the schools of thought is the key to understanding the differences between the evaluation of the same events by different scholars and, by extension, relevant policymakers. The perspective is vital for the policy choices (e.g., the introduction of weapons to orbits) and thus further clarifies the choices made by the actors (e.g., the shift in the US approach to space under different administrations). They also reflect the basic streams of thought as identifiable inside the theoretical literature regarding politics in outer space with its technological and environmental specifics.

Determinants of the 21st century Astropolitics

Once the main streams of thought were presented, it is crucial to identify some key topics that the geopolitical analysis of the domain in the foreseeable future must not avoid – the issue of actorness; nature of the relationship between the space powers; level of technological progress; possibility of introduction of weapons into outer space; utilisation of natural resources; and the issue of sustainability of space activities. The first issue that must be raised is one of actorness. A geopolitical actor is defined, for example, by Sirke Mäkinen, as any actor whose influence might be felt in at least two regions on the globe.[23] As pointed out by Flint, the geopolitical actors no longer need to include only national states but involve other types of actors as well.[24] In the space arena, we can see two processes appearing simultaneously that will shape the nature of the activities – spread of the number of actors and the inclusion of the different types of actors. The first change is related to the proliferation of activities among the nation-states. Even though the capacity to operate a full-scale space program is still limited to a small number of actors (USA, China, Russia, Europe, India), other states are increasingly active in their attempts to be relevant in at least

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[22] Joan Johnson-Freese, *Space Warfare in the 21st Century: Arming the Heavens*, Routledge, London, 2016, p. 57.

[23] Sirke Mäkinen, "Geopolitics Teaching and Worldviews: Making the Future Generation in Russia", *Geopolitics*, Vol. 19, No. 1, 2014, p. 101.

[24] Colin Flint, *Introduction to Geopolitics*, Routledge, Abingdon, 2006, pp. 24–26.

some activities or to use the space assets for some limited national goals. This enhances not only the space traffic in general but also the conflicting potential as the domain is not limitless, and the number of valuable orbital slots is limited. Additionally, we can see an emergence of the so-called New Space that presents a set of private actors motivated by a completely different set of goals, thus re-shaping the nature of space activities towards short-term or sustainable profit rather than political advantage.[25] This change in actorness has its impact in many fields, including space law (currently the Cold War based and state-centric, focused on the political side of the endeavour), economy (utilisation of new space-based markets like tourism and mining), or security (increased space traffic, issue of debris creation, liability for damages). The outcome of the current dynamic process of change in actorness will have an impact on the nature of operations in the future. The struggle between economic and political objectives is to be expected, and this all inside an environment threatened by the process of debris creation and collisions. Also, the increased number of relevant actors decreases the independence of the activities of everyone. It decreases the probability of both normatively globalist and realist hegemonical extreme scenarios of the development of the environment to take place.

The second key issue is the relations between the space powers. Even though the actorness, in general, is broadened, we can still identify several vital powers whose activities will have a critical impact on the nature of the activities in outer space as well as on the legal and normative framework guiding the other actors. Among the space powers, the United States, China, the European Union/European Space Agency, Russia, and possibly India must be included. They all possess holistic capabilities regarding space activities and hold an essential role in international politics. Currently, we can observe growing tensions between the US and China and the increased isolation of Russia that is, nonetheless, dependent on co-operation with other actors in its financing of space activities. In this sense, we can predict the continuing co-operation between the European and US space programs, Sino-American and Sino-Indian competition, Sino-Russian co-operation, and a push of the Russian space program to remain in contact with the other powers to receive financing in return for the technological support (meaning selling launches or technology to other agencies). The role of the space powers is also vital to the overall setting

[25] See Deganit Paikowsky, "What Is New Space? The Changing Ecosystem of Global Space Activity", *New Space*, Vol. 5, No. 2, 2017, pp. 84–88; Elizabeth Quintana, "The New Space Age", *The RUSI Journal*, Vol. 162, No. 3, 2017, pp. 88–109.

of the environment for future activities. If the more military note gains hold, outer space might be turned into a hostile zone filled with orbital debris, making any sustainable activity impossible. On the other hand, a more pragmatic and responsible approach would allow the private actors to open new economic potential of the domain. We can currently observe a push towards this dimension, especially in the US. The administration passed a law allowing for space mining[26] (followed later on by Luxembourg[27] and probably the United Arab Emirates), and the authority over the space traffic management was placed by Donald Trump on the Department of Commerce.[28] This, nonetheless, does not mitigate the military motivation for utilisation of the domain nor the potential for a large-scale conflict. Thus, the activities of the great powers, limited by the environmental factors and the presence of other actors, will have a key impact on the geopolitical implications.

An additional issue is the speed and path of future technological progress. The ability of the actors to project their goals in the space depends on the technological capabilities to conduct such actions. Simply speaking, there cannot be a power projection without technological means to operate in the environment and conduct necessary activities. In the outer space domain, the nature of technological progress will have a clear impact on the geopolitical landscape. In the current conditions, the relations are necessarily more cooperative as it is impossible for the actors to conduct sustainable hostile operations that would not lead to the diminishing of their own capacities. The situation is, nonetheless, changing, and the ability to interfere in the operations via cyber or electronic means and the ability to conduct threatening proximity operations is increasing. Furthermore, any resource extraction is also limited by this same factor further, putting aside the geopolitical factor often influencing the nature of relations in other domains. The development of efficient means of disruption, settlement of other celestial bodies, or resource extraction primarily

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[26] "U.S. Commercial Space Launch Competitiveness Act", H.R.2262, Public Law 114–90, 114th Congress, 25 November 2015, https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf, 11/11/2019.

[27] "Law of July 20th 2017 on the Exploration and Use of Space Resources", Luxembourg Space Agency, 20 July 2017, https://space-agency.public.lu/en/agency/legal-framework/law_space_resources_english_translation.html?fbclid=IwAR3z5NVzo8Jmwu_vllHgCc1E-elgJQHMLXmvGjWKiiULHwf7OPMMEbhCP8I, 11/11/2019.

[28] "Space Policy Directive – 3, National Space Traffic Management Policy", 18 June 2018, Presidential Memoranda, US President, whitehouse.gov/presidential-actions/space-policy-directive-3-nationalspace-traffic-management-policy/, 11/11/2019.

from the Near-Earth Asteroids would present the actors with additional means and goals that would broaden their scope of activities and consequently affect the relationship and the nature of interactions among these. As it is improbable that all technologies mentioned above will be developed simultaneously, the path followed – meaning whether the economic or military assets will prevail – might influence the geopolitical landscape rather substantially.

The nature of the domain will be additionally shaped by the potential introduction of weapons and the reason for such an action.[29] The only type of weapons currently banned from being introduced into the domain is the weapons of mass destruction. The first restriction came inside the so-called Partial Test Ban Treaty[30] that disallowed testing of the nuclear devices in the domain followed by the total ban of the introduction of any weapons of mass destruction into outer space in the so-called Outer Space Treaty.[31] Other weaponry, disregarding the problems with defining the space weapon due to the dual-use nature of the space technology, is not regulated by any particular provision. Nonetheless, the introduction of weapons has, for technical and economic reasons, not yet taken place. On the other hand, we can witness the increased malign utilisation of dual-use technology and the utilisation of the electronic and cyber means of warfare. The cases of jamming and spoofing of the navigational signals are, to give one example, quite often connected to the activities of the Russian Federation. One example of this is the spoofing of the GPS signal throughout the Trident Juncture NATO exercise.[32] The introduction of kinetic or direct energy weapon systems in orbits might lead to a shift from the current low-intensity conflict to more direct combat with the potential to set up a cascading debris crisis that would disallow from further utilisation of the domain. There might be a reason to pursue such a course of action – e.g., by a spoiler actor not utilising the space services – but for

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[29] Some scenarios are introduced in Vishnu Anantatmula, "U.S. Initiative to Place Weapons Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia", *Astropolitics*, Vol. 11, No. 3, 2013.

[30] "Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water", 10 October 1963, https://treaties.un.org/doc/Publication/UNTS/Volume%20480/volume-480-I-6964-English.pdf, 12/11/2019.

[31] "The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", RES 2222 (XXI), General Assembly of the United Nationas, 19 December 1966, https://www.unoosa.org/pdf/gares/ARES_21_2222E.pdf, 14/11/2019.

[32] See, for example, Elisabeth Braw, "The GPS Wars Are Here", *Foreign Policy*, 17 December 2018, foreignpolicy.com/2018/12/17/the-gps-wars-are-here/, 15/11/2019.

the space powers, this seems to be an improbable course of action, and these will likely pursue other means of competition.

A key topic of geopolitics is the control over the resources and the line of communications used for their transport. This topic will be raised in outer space, as well. We are well aware of potential riches present on celestial bodies like the Moon (Helium-3, an isotope to be used in the nuclear fusion energy generation not present on the Earth), or resource-rich asteroids (some containing vast amounts of valuable metals like gold, platinum-grade metals, or rare-Earth materials). As for the provisions of the Outer Space Treaty, countries cannot claim sovereignty over any location in the domain, and this was followed so far. Nonetheless, the issue of mining, retaining, and capitalizing on resources is contested. For example, the United States and Luxembourg decided to solve the issue by legalizing the conduct explicitly inside their national laws, but the international approach is still unclear. The future space miners will thus operate in an uncertain environment, unable to claim territorial control over a valuable mine that might lead to new conflicts. Nevertheless, the control over the lines of communications and a presence on the valuable mining sites will further enrich the geopolitical landscape of outer space and add additional conflicting and cooperative incentives to the relevant geopolitical actors.

Finally, there is the issue of security and sustainability of the domain. Outer space needs a more precise set of rules guiding the actors' behaviour, especially connected to the space traffic management and orbital debris issue. If these two issues are not solved, the domain will increasingly become useless as the movement in the low orbital space will become extremely risky due to the collision hazards. What is also important is the nature of the rules that will be, in no small degree, devised by the space powers. To give an example, the recent placement of the topic in the United States under the Department of Commerce points to a more business-friendly approach of the Washington government, while the military hierarchy of the Chinese space program will most likely lead to the promotion of the less private-oriented provisions. These rules will consequently shape the environment for the foreseeable future.

Conclusion

Geopolitics – analysis of power distribution in space – is not restricted to the terrestrial domains only. There is a clear case for the utility of geopolitical analysis of outer space with its unique form of geography set up by the gravitational

effects of the bodies and very harsh environmental risks such as radiation. Given the foreseeable technological progress, the geography of further places (like the Moon) will become relevant as well, and we should witness an interaction that will be, similarly to the Earth, dominated by the competition over the lines of communication, geostrategically important locations, and locations rich in natural resources. While currently, the most essential resources include orbital slots and assignment of bandwidth, the future technological progress might allow us to exploit other types of resources as well.

The article covered the main schools of thought and determinants relevant for the analysis of the political space in relation to outer space. It clearly illustrated that the domain was similar to other domains and thus fit for a similar type of analysis as land, sea or air. This is important as it gives us the much-needed perspective to spot the reasons the same events are analysed differently and to think more clearly and systematically about the moves of different actors in the domain. This presents the same picture as with the analysis of any other event in the international politics.

The presented determinants (the issue of actorness, the relations between space powers, technological progress, introduction of space weapons, utilisation of natural resources and sustainability of space operations) show the way forward. By keeping in mind what are the main stakes, the academia and practitioners can be more aware of the impact of the decisions different relevant actors make. Having a clear idea about the main issues allows one to make much more relevant decisions and root the analysis of the events into a clearer framework. The field of astropolitics aims to help with just that. The way how these determinants are tackled will affect the outlook of the political space in the domain for the decades to come, thus affecting the geopolitical analysis as well.

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ASTROPOLITIKA: DA, TO STVARNO POSTOJI

Apstrakt: Rad pruža pregled centralnih pristupa izučavanju geopolitike svemira i predstavlja neke od ključnih izazova sa kojima će se međunarodna zajednica suočavati u budućnosti. Geopolitika kao pristup analizi međunarodne politike generalno razmatra uticaj geografije na političke procese. Kroz istoriju, razvijeni su pristupi koji analiziraju uticaj različitih tipova terena ili različitih tipova okruženja (more, vazduh, kopno) na odvijanje političkih aktivnosti. Međutim, tek devedesetih godina 20. veka je Everet Dolman (Everett Dolman) primenio geopolitički pristup na svemirsku ravan. Od tada, brojni pristupi ovom pitanju su razvijeni, i pravac poznat kao Astropolitika polako postaje značajan element akademskih razmatranja. Autor analizira neke od fizičkih karakteristika neophodnih za razumevanje mehanizama svemirske ravni i zatim predstavlja neke od ključnih pravaca razmatranja u okviru geopolitčke misli. Analiza se fokusira na pitanja delatnika, odnosa između svemirskih sila, tehnološkog napretka, uvođenja svemirskog oružja, utilizacije prirodnih resursa i održivosti svemirskih operacija. Autor zaključuje da zbog očekivanog tehnološkog progresa u budućnosti, svemirska ravan će postati sve značajnija i za istraživače i za donosioce odluka u njihovom pristupu međunarodnoj politici, zahtevajući sveobuhvatnije razumevanje uticaja procesa u ovoj ravni na političke događaje i odnose.

Ključne reči: svemir, geopolitika, projekcija moći, svemirsko okruženje, astropolitika, tehnologija, bezbednost.