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The application of offensive realism in outer space as a fifth operational domain

Diplomová práce

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Abstrakt

Práce se zaměří na aplikaci neorealistické teorie ofenzivního realismu Johna Mearsheimera na vesmír jakožto novou operační doménu, ke které čím dál více směřuje pozornost státních aktérů na poli bezpečnosti, jak dokumentuje oficiální uznání v rámci NATO, vznik Vesmírných sil USA, či diskutované testy protisatelitních zbraní. Úvodní část práce po definici teorie je zaměřena na porovnání v rámci operačních domén a definování unikátních znaků, které činí doménu jedinečnou. Zvláštní pozornost je posléze věnována současným technologiím protisatelitních zbraním a jejich využití v souladu s teorií, která staví na maximalizaci síly. Dále se věnuji strategicky významným bodům na oběžných drahách a dalším součástem domény, které by se mohly stát cílem soupeření. Cílem je zhodnotit, jak moc lze teorií ofenzivního realismu vysvětlit chování a motivaci relevantních aktérů v doméně. Aplikace jednotlivých znaků ofenzivního realismu je přehledně uvedena v tabulce na konci práce.

Abstract

My MA dissertation focuses on the application of the John Mearsheimer's neorealist theory of offensive realism in outer space as a new military operational domain, which is becoming more and more relevant for the state actors, as shown by the official recognition of the domain by the NATO, the establishment of the US Space Force or tests of anti-satellite weapons. Following the definition of the theory, a comparison of space to the other operational domains is made, with emphasis on the unique features of space. Subsequently, the contemporary technologies of anti-satellite weapons are defined, including their use in accordance with the theory, which is based on power maximization. The part is dedicated to the strategically important points on the Earth's orbits and to other features of the domain, which may become the subject of a contest. The results of the application of offensive realism are shown in a table in the last part of my dissertation.

Klíčová slova

Ofenzivní realismus, operační doména, vesmír, protisatelitní zbraně, orbity.

Keywords

Offensive realism, operational domain, outer space, anti-satellite weapons, orbits.

Název práce česky

Aplikace ofenzivního realismu na vesmír jakožto pátou operační doménu

Poděkování

Rád bych poděkoval Mgr. Bohumilu Dobošovi, Ph.D., za cenné rady při vedení práce a vstřícný a trpělivý přístup. Také děkuji Tomovi McEnchroe za pomoc s jazykovou stránkou práce. V neposlední řadě děkuji své rodině za podporu během psaní práce.

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List of Abbreviations

AM - Amplitude modulation

ASAT - Anti-satellite weapon
CCS - Counter Communications System

C4ISR - Command, control, communications, computers, intelligence, surveillance, and reconnaissance

DA-ASAT - Direct-ascent anti-satellite weapon

DEW - Directed energy weapon

DSRO - Defence Space Research Organisation

EM - Electromagnetic spectrum

ESA - European Space Agency

EW - Electronic warfare

FM - Frequency modulation

GEO - Geosynchronous Earth Orbit

GHz - Gigahertz

GLONASS - Global Navigation Satellite System (Russia)

GNSS - Global Navigation Satellite System

GPS - Global Positioning System

HPM - High-powered microwave

ICBM - Intercontinental ballistic missile

ISS - International Space Station

ITU - International Telecommunication Union

L1-L5 - the Lagrange points

LEO - Low Earth Orbit

MAD - Mutually assured destruction

MEO - Medium Earth orbit

NASA - National Aeronautics and Space Administration

NATO - North Atlantic Treaty Organization

RF - Radio frequency

RPO - Rendezvous and Proximity Operations

SSA - Space Situational Awareness

USA or US - United States of America

USSR - Union of Soviet Socialist Republics or Soviet Union

Introduction

This MA dissertation focuses on outer space as a new operational domain. The focus on space from the military perspective has massively increased with the introduction of exciting new technologies, as shown by the declaration of outer space as a fifth military domain by NATO and the establishment of the US Space Force. Support of space infrastructure for troops on the ground becomes essential. However, space also matters when it comes to commercial interests and everyday life, for example satellite navigation, use of credit cards, weather forecasts or TV broadcasts. Thus disruption of space assets would have far-reaching consequences. The development of new technologies and an increasing dependence on space puts more emphasis on space security, which becomes more and more relevant as a field of study.

As a theoretical background, I chose offensive realism based on the theory of John Mearsheimer. The reason for my choice is the close connection of the theory to the security realm. My aim is to find out whether the theory is applicable to space as an operational domain and can explain the current behaviour of state actors, including for example, the recent anti-satellite weapon tests leading to international tensions. The research question is "Is it possible to explain motivation and behaviour of state actors in space through the logic of offensive realism?". When applying the theory, I will focus on the present state of the domain and contemporary events such as anti-satellite weapon tests. The goal of my work is not to predict what the future war in space might look like. Instead, I examine the existing space capabilities of the most relevant space powers.

The work starts with setting the theoretical background of offensive realism. The theoretical flaws based on academic papers are also included. After this, there are parts dedicated to the space domain and its unique features. In this part, I deal with how space is different from the traditional domains and how this influences options to operate within the domain. A chapter dealing with anti-satellite weapons follows. First, explaining the contemporary technologies in general, to explain how weapons could impact the domain. Secondly, I define the capabilities of each significant state actor. Subsequently, the application of offensive realism on the domain follows, transforming key concepts into the space environment. Limits of the approach are discussed as well before evaluating the results coming from the application in the conclusion.

1.Theory of offensive realism

Before applying the theory on the space domain, it is necessary to define the main signs and explain the logic of offensive realism. The theory builds on the classical realism of Hans Morgenthau and his six principles of political realism, in its state-centricity and emphasis on power. The modifications place this theory more under the umbrella of the neorealism introduced by Kenneth Waltz in 1979. Offensive realism has been described in John Mearsheimer's The Tragedy of Great Power Politics (2001), which can be considered as the most significant contribution, specifying the key concepts. Theory is based on the analysis of historical examples of great power politics and can be understood as a reaction to the concept of defensive realism presented by Waltz.

Mearsheimer starts by finding five basic assumptions about the international system, which help to explain why states pursue power (Mearsheimer, 2001). Firstly, the international system is characterised by anarchy, meaning that the system comprises of independent states without any central authority ruling over them. Secondly, great powers inherently possess offensive military capabilities, giving them the option to cause harm or even destroy other states, therefore states are dangerous to each other. Thirdly, states can never be sure about the intentions of other states. However, there might not be any hostile intentions. There never is certainty. Moreover, states can change intentions from one to another. The uncertainty is unavoidable. Fourthly, the main objective of all states is securing their own survival. Ability to maintain territorial integrity and autonomy of domestic political matters is crucial and dominates all other goals. Finally, states behave as rational actors. In other words, states consider preferences of other actors and how their own actions will shape the system and plan in the long run to achieve their goals.

Mearsheimer claims that none of these assumptions alone lead to aggressive foreign policy, but when brought together in the international system, the result is behaviour motivated by fear of neighbours, self-help and attempts to maximise power (Mearsheimer, 2001). Therefore, there are not good and bad states. Each state is pushed towards offensive actions because of the nature of the international system. That is unavoidable as states cannot choose to not participate in this system. Although Mearsheimer and Waltz agree on basic aspects like anarchy in the international system and the importance of power maximisation, their theories differ in understanding state behaviour. Waltz claims that based on the structure of the system, the preferred behaviour of each state is to preserve the current status quo and secure its position

(Waltz, 1979). That is based on the concept of balance of power. On the other hand, Mearsheimer sees states as revisionists rather than status-quo seekers (Mearsheimer, 2001).

States pay attention to the distribution of power and try to gain additional increments of power. Great powers are thinking about power as a zero-sum aspect. To put it more simply, states can only get power at the expense of other states. To gain power, someone else must lose it. Strengthening a position in the system and at the same time weakening the rival states is crucial for ensuring their own security. Mearsheimer distinguishes between actual and potential power (Mearsheimer, 2001). Actual power equals army capacity and the ability to defeat foes. Potential power is based on the state's population and wealth, allowing it to build up military capabilities.

Mearsheimer also divides military power into more subcategories based on the operational domains - independent sea power, strategic airpower, land power, and nuclear weapons (the book was written in 2001, which means that cyber and space warfare are not involved) and says that land power is the dominant form of military power supported by air and naval forces, while large bodies of water prevent power projection (Mearsheimer, 2001). Ground forces are the most significant part of the army because they are key for conquest and control of land, which is the supreme political objective. This claim is supported by the historical examples of the Napoleonic wars and both world wars with all major events won by the power of infantry. However, great powers with possession of nuclear weapons have capacities of unimaginable destruction, there is a possibility for retaliation. Therefore, even though competition will continue, the key component will be land power.

The pursuit of power only stops when the state becomes a hegemon in the international system, which is the most desirable status, as the state's existence cannot be endangered by any actor. The reasoning behind that is that it is extremely difficult to determine how much power is enough to be secure from rivals and how the distribution of power will change in the future. Hence, hegemony becomes the easiest and the most certain strategy. Mearsheimer speaks about regional hegemony, as it is almost impossible to achieve world hegemony (Mearsheimer, 2001). Once regional hegemony is achieved, the regional hegemon works in order to prevent other great powers from becoming hegemon as well, as seen on the case of American hegemony and preventing imperial Japan, Wilhelmine and Nazi Germany, and the Soviet Union from gaining regional hegemony.

But even if achieving the position of hegemon is not possible due to military capabilities, states will still attempt to get as much power as possible, because every maximisation improves the odds for survival. Furthermore, the security dilemma plays a role. The concept first defined by John Herz means that every measure to reinforce defensive capabilities, increases distrust and lowers the security of other states. Thus preventive offensive behaviour becomes the most rational option on the table (Herz, 1951). Referring to Mearsheimer, it is impossible to get rid of the security dilemma because states operate in anarchy (Mearsheimer, 2001).

However, states weigh costs and benefits before taking action and this in turn influences the system itself, there is a possibility of miscalculation. States can exaggerate their own power or miscalculate the reaction of their neighbours. Disinformation can also increase the probability of poor decision-making. The same can be said about new technologies, as it is hard to predict their unpack on the battlefield. According to Mearsheimer, defensive realists claim that offensive actions rarely succeed before systematic constraints and thus it is more efficient to use resources on preserving the status quo, but when examining wars between years 1815 and 1980, attackers won in 39 out of 60 cases (Mearsheimer, 2001). Another claim of defensive realism, namely that states pursue aggressive foreign policy because of pernicious domestic politics, is hard to prove as well, since states that behaved aggressively had all kinds of political systems.

Survival is the main goal of states but is not the only objective. Other goals that states pursue in competing for power and influence are the striving for regional hegemony in their own region, improving their economies and building strong armies. Offensive realism admits that states can pursue non-security related aims as well. These can be seeking economic prosperity for enhancing welfare levels, promoting ideology abroad (for example the USA spreading the idea of democracy during the Cold War), and supporting human rights abroad. However, these goals are only pursued if they do not challenge the existing balance of power. If so, states would behave in accordance with the realist theories, giving priority to power and survival before other means.

The willingness to achieve hegemony does not stop even in the realm of nuclear weapons. However, defensive realists believe that the MAD (mutually assured destruction) system stops great power from offensive tendencies, Mearsheimer says that states still strive for nuclear hegemony (Mearsheimer, 2001). This finding is proven by the development of nuclear arsenals of both the United States and Soviet Union during the Cold War. At first the United States possessed a nuclear hegemony, because the Soviet Union was second to acquire nuclear

weapons. After this, the United States strived for a first-strike capability, allowing the elimination of Soviet nuclear power without the risk of a massive retaliation. The Soviets continued their research as well and that led to the MAD stage. Even then, the USA prepared plans for limited nuclear exchanges during Kennedy's administration in 1961, in the belief that the enemy would respond accordingly. Also the Soviet Union planned to win the nuclear war by limiting damage to its own territory and increasing costs for the opponent. The reality in which each of the great powers attempted to gain nuclear hegemony speaks against the theory of defensive realism.

How do states fulfil the goal of acquiring relative power? The main strategy is war. But only in the case when the expected benefits outweigh the costs of waging war, because states are rational actors. Mearsheimer also deals with the hypothesis that aggression always economically damages the aggressor and thus is not an effective way for gaining power (Mearsheimer, 2001). That is proven in examples of the USA in the 19th century or Prussia between 1862 and 1870 when the aggressive foreign policy had a positive effect on the overall economy. Offensive states have the possibility of exploiting conquered territory and the opponent's economy in order to finance the war campaign. Alternative strategies for gaining power are blackmail, bait and bleed – an initialised protracted conflict between 2 rivals or bloodletting – making sure that the opponent engages in a protracted and bloody conflict to increase the cost of his moves. The alternative options are more difficult to carry out though and hence less common than the usual war.

Great powers must not only maximise their own power but at the same time prevent foes from acquiring power at their expense. That calls for different strategies. According to Mearsheimer, states can either choose to balance or use buck-passing (Mearsheimer, 2001). With balancing, the state takes full responsibility for deterring aggression and goes to war when its strategy fails. Balancing can be done in several ways. Firstly, states can use diplomatic channels to inform the aggressor that they are committed to the current balance of power and will not hesitate to fight in case of aggression. Secondly, states under threat can create a defensive alliance which is called external balancing. Nevertheless, alliance behaviour is not possible in a bipolar world. Furthermore, as Mearsheimer states, functional external balancing might not work, because it is difficult to quickly put alliances together and make them effective at deterring the aggressor (Mearsheimer, 2001). The last option is internal balancing which consists in mobilising one's own additional resources, for example by prioritising military spending and cutting finances for other sectors.

Buck-passing is an alternative to balancing. The buck-passer tries to get another state (buck-catcher), which is also threatened by the same aggressor, to deter or even fight the offender. Mearsheimer identifies four ways of doing so (Mearsheimer, 2001). At first, the buck-passer can try to improve diplomatic relations with the aggressor in the hope that it attacks another threatened state instead, which will have to defend itself and fight the threat instead of the first state. To illustrate, we can look at France and the Soviet Union before the Second World War when they attempted to have good relations with Nazi Germany.

Alternatively, a state establishes hostile relations with another state intending to buck-pass, that is to support good relations with the aggressor, because it doesn't want to be dragged into conflict by third parties. This can again be explained through the behaviour of France and the Soviet Union, as both countries had bad relations in the 1930s. Even though states attempt to buck-pass, they still must build a strong enough defence. This is because in a system with two buck-passing nations, there is no chance to be sure if the strategy will work out. If the attempt fails, the state will have to fight on its own. Both France and the Soviet Union also tried to foster military power, despite attempts to make Germany attack the other state instead. The buck-passer can also facilitate growth of the intended buck-catcher, who would then have a better chance of containing the aggressor. For instance, Great Britain and Russia relied on the power of Prussia between the years 1864-1870 to deter France from expansion.

Referring to Mearsheimer, there is a strong tendency for great powers to prefer buck-passing rather than balancing (Mearsheimer, 2001). Free riding is a preferred strategy even in alliances. For example, Great Britain worked to minimise their amount of troops on the western front during the First World War, to save power for the latter years of the conflict. The reason is simple - buck-passing allows for a cheap defence. States do not have to waste resources and risk possible loss of power when they get the other side to fight for their cause. In a perfect scenario, there can even be benefits for the buck-passer, when the buck-catcher and the aggressor get caught in a protracted and expensive conflict. Both fighting sides could lose a considerable amount of power, shifting the balance of power for the benefit of the buck-passer. For example, the United States hesitated with using their own infantry in the Second World War until 1944 and managed to weaken Soviet power this way. Buck-passing might fail, either when the intended buck-catcher doesn't catch the buck or when the buck-catcher fails to successfully defend himself and then the buck-passer must fight on his own. Nonetheless, buck-passing still remains a preferred strategy to balancing in the theory of offensive realism. On the contrary, defensive realists advocate for the balancing approach as the most rational way of

defending state power. Mearsheimer also speaks about the inadvisability of bandwagoning as it means giving up power on behalf of a foreign state, which goes against the logic of offensive realism (Mearsheimer, 2001).

After describing the way the theory works and its basic assumptions, Mearsheimer searches for evidence supporting his claims (Mearsheimer, 2001). To prove the logic of offensive realism, the evidence builds on historical examples of foreign policy of five great powers and regional hegemons. These are Japan from the Meiji Restoration in 1868 to its defeat in the Second World War, Germany from the beginning of Bismarck's period in office until its defeat at the end of the Second World War, Soviet Union from its birth in 1917 until its collapse in 1991, Great Britain between 1792-1945 and finally United States in years 1800-1990. Strategic thinking of Japan, Germany and the Soviet Union in the specified years strongly supports this theory. These countries were looking for opportunities to expand their territory through contests and gain power this way.

Japan and Germany did not hesitate to start a world war to achieve that, while the Soviet Union was stopped by the US from its power ambitions in the continental Europe. None of the leaders remained satisfied with the current status quo and all chose to alter it because they simply had a capacity to do so. Their final goal was to become a regional hegemon in order to secure the survival of the state. Conversely, the case of the United States and Great Britain is more difficult when trying to spot behaviour following the logic of offensive realism. The United States pursued hegemony in the Western Hemisphere during the nineteenth century and succeeded. In fact, the United States is the only great power in modern history that managed to become a regional hegemon. Only the presence of oceans stopped the US from expanding into Europe and Asia as it would be extremely complicated to achieve land control of oversea territories. The United Kingdom also faced the geographical reality of the English Channel complicating a possible conquest of Europe. Nevertheless, both powers still behaved as offshore balancers on the continent, preferring to buck-pass instead of balancing as the theory suggests.

The difficulty of projecting power over Oceans and geography in general play a big role in offensive realism. For example, Germany's lack of natural defences makes it very vulnerable, which resulted in an increased effort to build a strong army and secure the country by becoming a great power. Despite that, Germany did not pursue an aggressive foreign policy during 1870-1900, that was because of strategic calculus. Expansion could have dragged Germany into war with both France and Russia. At this time, Germany did not have sufficient power to defeat

both foes at once. Therefore, states always consider the real situation and all possible outcomes before making decisions to gain power by strength.

Another argument of defensive realism is that the logic of offensive realism does not always work, as cases of overextending states suggest. Usually, the argument builds on 3 historical examples – Wilhelmine (specifically 1890-1914) and Nazi Germany and Japan before the Second World War to prove that these states lost more than they gained, that they would be better off sticking to balancing of other great powers. Mearsheimer offers another perspective (Mearsheimer, 2001). We have to examine the decision-making process that led to waging war, instead of focusing solely on the result which was a fatal loss. The analysis reveals that the decision could have been seen as rational in the historical context, taking into account all of the various factors that these states faced.

When predicting conflicts, theory also takes into account the polarity of the international system and the balance of power. Bipolarity is considered as more stable than multipolarity. That is because bipolar systems mostly consist of two states with roughly equal amounts of power. Great power wars in this system are not frequent and if a conflict occurs, it is rather a big power fighting a minor state. While there is a shared position with defensive realists on bipolar systems being less war-prone than multipolar ones, Mearsheimer goes beyond that assertion when distinguishing balanced and unbalanced multipolar systems (Mearsheimer, 2001). Unbalanced multipolarity is war-prone because potential hegemons have a considerable power advantage. In other words, other great powers do not possess the military capabilities to challenge the status quo. On the other hand, balanced multipolarity happens when there are more than two great powers with similar capabilities, making the probability of system change real.

To get an alternative view on the behaviour of great powers and their offensive tendencies, we can look at the theory of Graham Allison with his concept of the Thucydides trap applied on the Rise of China. This theory corresponds with Mearsheimer's claims about breaking the status quo and maximising power to secure one's own survival. Allison claims that the contemporary hegemon always tries to defend his position against a rising power threatening its hegemony (Allison, 2018). The name of the theory is derived from the situation before the Peloponnesian War. The dominant position of Sparta had been threatened by the rising power of Athens, leading to a damaging conflict. Also Allison supports his theory with historical examples (Allison, 2018). His research examined 16 historical examples from the 15th century. Twelve of these conflicts between a hegemon and a rising power led to war. The logic of offensive realism can be found in claims that China will focus on the role of global hegemony after

acquiring the role of regional hegemon in Asia. China does not possess a considerable military advantage yet though, which means that the most rational decision is to continue its economic growth (potential power) allowing for the build-up of a stronger military (actual power).

1.1 Critics of offensive realism

There has been a frequent critique from the ranks of defensive realists. However, they share common assumptions with offensive realists, defensive realism believes that states value security the most rather than power, therefore states are predominantly defending the status quo. Defensive realists claim that seeking hegemony almost always leads to defeat.

Mearsheimer mentions that states can have relatively “benign intentions". What is forcing them to behave aggressively is the structure of anarchy and uncertainty. Because of rationality which is another basic assumption upon which offensive realism is based, states always weight the costs and benefits before engaging in conflict. If this would be true, then it would be irrational for the state that has little to gain and much to lose, to risk their position in the international system and wage war. Mearsheimer realised this and added a variable of miscalculation explaining why status quo states fight wars. Pashakhanlou argues that under these circumstances uncertainty would have to be the main explanation in the theory, but it is only a structural and material theory of the international system (Pashakhanlou, 2013). Miscalculation is not even mentioned amongst the 5 basic assumptions of offensive realism (anarchy, military capabilities, uncertainty, survival, and rationality). However it would be essential for explaining security competition. Rationality should make way for miscalculation in the assumptions instead. Therefore, Pashakhanlou identifies contradictory logic in the theory – states are believed to be rational but act under miscalculation in self-defeating behaviour (Pashakhanlou, 2013).

Another critique can be raised over the hegemonic mechanism. Mearsheimer claims that states always maximise power with the aim of becoming a regional hegemon and even after that they should aspire for global hegemony. One of the provided historical examples is the rise of the United States in years 1800-1900 leading to regional hegemony in the Western hemisphere. According to the theory, the United States would conquer Canada and Mexico after 1850 but that never happened. Mearsheimer argues that it was the power of local nationalism which made it difficult to turn people into American citizens. Furthermore, offensive realism claims that after one country becomes a regional hegemon, the system ceases to be anarchic and becomes hierarchical. But theory says that offensive realism based on the premise of anarchy has little to say about hierarchical politics. Therefore, the theory cannot explain most of the historical

events in American history from the last century. That is why Mearsheimer declines to accept that the contemporary international system is unipolar with the United States as the main hegemon. That would make the system hierarchical, preventing the theory from explaining global events. Thus Mearsheimer claims, and has to claim, that we are living in a multipolar order to make his theory work. Referring to Pashakhanlou, that is also why Mearsheimer sets the bar for achieving regional and global hegemony so high (Pashakhanlou , 2013). If states manage to gain these positions, it will lead to hierarchy and thus anomaly in the system once again. American actions from recent history such as the invasion of Iraq and Afghanistan, do not correspond with the basic logic of the theory either. The United States as the only hegemon shall act as offshore balancers and intervene only in case a competitor challenges their hegemony.

Furthermore, Pashakhanlou claims that the empirical part of offensive realism suffers from selection bias (Pashakhanlou, 2013). "Selection bias, also known as sampling bias, usually refers to groups (e.g., experimental, control) that are systematically different prior to experimental manipulation or intervention due to the assignment of participants to groups. Variations detected during a study are attributable to group differences due to selection bias or the independent variable (e.g., manipulated variable) (Frey, 2018). That is because the cases of - Japan (1868–1945), Germany (1862–1945), the Soviet Union (1917–1990), Italy (1861–1943), Great Britain (1792–1945) and the United States (1800–1990) only include some of the most aggressive great powers. Mearsheimer claims that he could not add other examples because of space limitation, but that does not explain why he could not include one of more benign countries. Results are then generalised as Mearsheimer expects every other country to behave in the same way. The success rate Mearsheimer talks about (between years 1815 and 1980, when the attacker won in 39 out of 60 cases) is also not supported by his selected cases, as only one nation out of 5 managed to become a regional hegemon – United States.

Lastly, Pashakhanlou points at the inconsistency between the explanatory power of geography and the distribution of power. At first Mearsheimer claims that offensive realism treats states as unitary actors that only differ in power, but later adds that the insular great powers such as the United States and United Kingdom do not project their power because of large masses of water preventing aggressive behaviour. That does not explain the case of Japan and its imperial ambitions resulting in very aggressive foreign policy in the first half of the 20th century. To justify this and save the logic of the theory, Mearsheimer claims that the case of Japan can be explained through the weakness of its rivals, which helped Japan to overcome its geographical

obstacles. Once again, this results in an inconsistency as it is unclear whether unit-level variables of geography or the systemic factor of power distribution determine the outcome of a state's behaviour. Mearsheimer adjusts the theory to the specific cases to maintain an internal logic, but this comes at the expense of misusing data. That is wrong, because offensive realism claims to be both a normative and empirically accurate theory.

Valeriano also tests the empirical logic of offensive realism in his paper named The Tragedy of Offensive Realism (Valeriano, 2009). To do that, he uses head-to-head tests with 2 other theories trying to explain causes of conflicts - Wallenstein's Periods of Peace based on norms and territorial explanation by Vazquez. According to Wallerstein, there are certain periods when the norms are not established in the international system, and states rely on unilateral actions (particularist period) and periods with implemented norms (universalist period). The study shows that actors are more likely to engage in conflict when there is no set of rules guiding their actions. Territorial explanation theory suggests that the trigger of warfare is the issue over which both sides disagree and claims that the most war-prone type of conflict is a territorial dispute and thus states act offensively only when facing imminent territorial threat.

Valeriano sets 2 hypotheses to test the empirical consistency of offensive realism in comparison to the theories mentioned above (Valeriano, 2009). The hypothesis based on offensive realism are – 1) Major power dyads should maintain a constant rate of conflict and war, no matter what historical era or system of norms they are operating in during the conflict. 2) Disputes involving major power dyads should be equally likely to escalate, regardless of issue type. The hypotheses compare offensive realism with Wallenstein's work and the Vazquez's territorial theory.

Using datasets from the project Correlates of war, Valeriano found out that Wallenstein's theory of periods of peace is better suited to explain occurrence of major power wars than offensive realism (Valeriano, 2009) This means that conflicts are not uniform regardless of historical periods, but norms play a role. In other words, when great powers agree on norms in the international system, the occurrence of wars decreases. The second hypothesis was not confirmed either. Instead, the results reveal that certain inter-state disputes are more war-prone than others. Specifically, states are more willing to fight over territorial issues rather than anything else, which proves the theory of Vazquez. This finding goes against offensive realism as well, because Mearsheimer writes about uniformity of conflicts caused by maximisation of power and leaves out issue types. While norms and issue-based approaches do not offer explanation for all conflicts, they work better than offensive realism. Referring to Valeriano, offensive realism fails to predict behaviour between great powers and seems to work only when

it comes to behaviour of major powers towards minor powers, rather than explaining the reasoning of all states in general (Valeriano, 2009).

Finally, critiques directed at realism in general can be addressed to offensive realism as well. Theory might be seen as too state-centric, not taking other relevant actors in account – especially intergovernmental organisations and alliances, but also civil society groups. Other critiques can be raised over the power-centricity, which is dominates the whole theory, not paying attention to norms and social constructions. Realism focuses solely on conflicts rather than on cooperation and sees the cynical perspective of human nature in the spirit of saying "homo homini lupus" popularised by Thomas Hobbes.

2.Characteristics of the domain

Before speaking of outer space as an operational domain, it is necessary to mention the key characteristics of the whole space security domain. First, outer space has been defined as "the part of the universe lying outside the limits of the Earth's atmosphere" by National Aeronautics and Space Administration - NASA (National Aeronautics and Space Administration, 2008). NASA is operating within 80 kilometres from the Earth surface because that is the point in which aerodynamic control surfaces are no longer useful (Stone, 2012). Nonetheless, the defined boundaries might differ, for example there is the Kármán Line set at an altitude of 100 km which is officially recognized by the Fédération Aéronautique Internationale, because the standard of aerodynamics or aerostatics does not allow for flight anymore, ballistics, and orbital mechanics therefore come in as a solution.

Dolman defines orbit as "the path of a spacecraft or satellite caught in the grip of gravity" (Dolman, 2008). Objects in orbits rotate thanks to Newton's first law of motion. Orbital velocity is essential to stay in orbit. Finally, spacecraft located in stable orbit do not expend any fuel, making it essential to use the right orbit. The most efficient way of travelling is transferring between stable orbits to minimise fuel expenditure, making the points of transfer strategically important. The are 5 "libration points" are allowing fuel-free flights where the gravitational effects of Earth and Moon cancel themselves out. Because of space perturbations, only L4 and L5 are effectively stable and thus strategically important (Dolman, 2008).

Orbits are differentiated by their altitude. The first type is the low Earth orbit (LEO). LEO lies within the first 150-800 km to space (Dolman, 2008). The orbital period lasts 90 minutes, leading to 14-16 orbits a day. LEO is mostly used for Earth reconnaissance, used for military and resource management, but also for the International Space Station (Dolman, 2008). Polar LEO's with a specific inclination can be made to orbit always above a sunlight Earth, which makes them important for imaging satellites (Dolman, 2005). LEO's offer concentration communication links and a closer view of Earth. Another advantage is the relative cheapness of placing satellites on the LEO. The second type of the Earth orbits is the medium Earth orbit (MEO). MEO ranges between 800-35 000 km to space and allows 2-14 orbits per day. It is usually used for the supportive satellites ensuring functionality of satellites deployed in LEO and most importantly for the navigational satellites like US GPS (Global Positioning Satellite). Besides GPS, also Russian GLONASS, Chinese BeiDou and the European Space Agency's (ESA) Galileo global navigation satellite system use the LEO orbital range. Finally, the last type is high Earth orbit above 35 000 km, called the geosynchronous Earth orbit (GEO). Orbital

period there is no more than once a day. The orbit is identical to one full rotation of the Earth and with 0° seems to be fixed in the sky from any point on the Earth. Global communication and weather satellites are placed in the GEO zone.

Referring to Dolman, gravity is the most important part of space topography, because it dictates travel and strategic asset placement (Dolman, 2008). For any strategic calculations, it is necessary to understand the concept of gravity wells. When it comes to launching objects at the orbits, the deciding factor is the effort needed rather than the distance. That is because the object has to escape the gravity of the planet from which it has been launched. The more massive the body of the object, the deeper is the well. For instance, the Earth's gravity is 22 times deeper than on the Moon, thus it takes 22 times as much effort to make a journey into space than from the Moon. The journey from the Moon to Mars would hence be even cheaper than travelling from the Earth to the Moon despite the big difference in distances (385 000 vs 56 000 000 km) (Dolman, 2008).

In addition, there are other topographical characteristics of outer space, for instance the Van Allen radiation belts, located 58 000 km from Earth. High energy particles trapped by the Earth's magnetic field have high concentration of radiation and thus are avoided to prevent danger for crews (Marshall, 2021). Besides radiation, solar wind, vacuum, extreme temperatures are other defining features of outer space.

In our current period, objects still must be launched from Earth. There are certain locations of high strategic value used for launching spacecraft to outer space. That is because the Earth's spin can be used for the attainment of necessary orbital velocity. The relative velocity of the Earth is the highest at the equator, therefore the launching sites must be as close to the equator as possible, such is the case of Cape Canaveral for the USA, or Kourou in French Guiana for the ESA (Dolman, 2008).

2.1 The New Space

When analysing space as a new military domain, it is impossible to avoid mentioning the civil sector. That is because both spheres have been closely connected for decades. Since the beginning of the Space Race in 1955, rockets were being invented both for military needs and the benefits of exploration for mankind. Technologies used for strong rockets later found use in the lives of ordinary citizens, for example Teflon or the hook-and-loop fastener. Nowadays, thousands of satellites flying over our heads provide navigation services or make credit card payments possible. At the same time, similar satellites help armies to the map location of adversaries and target missiles fired at tanks. Even satellites alone can become a weapon when deliberately causing collision with another satellite. The dual-use nature of technologies must be considered when analysing the space environment (Paikowsky, 2017).

The contemporary space environment is often called the "New Space". This term is used to describe the new era dating since the beginning of the 21st century. This event is the dividing line between "Old Space" and New Space. Old Space had been dominated by the rivalry of the USA and USSR in the bipolar system, making the realm of space almost exclusively state-only (Paikowsky, 2017). NASA for the USA and the Soviet space program for the USSR were subject to national policies. The dual-use threat became relevant particularly because of the capability of rockets to carry nuclear weapons. Therefore, both sides imposed strict restrictions on space technologies seen as strategically vital for the defence of the state. This limitation caused a very low commercial activity in the space sphere for decades, remaining until the end of the Cold War.

The new strategic environment following the fall of the USSR made possible the lifting of restrictions on proliferation of space technology and the know-how needed for manufacture. The United States and Russia started cooperating on common projects. The best example of that is the International Space Station (ISS), launched in 1998 and consisting of American and Russian modules. Furthermore, Russia cooperates on interstate missions such as ExoMars (a common project of ESA and Russian space agency Roscosmos). Moreover, dual-use technologies became the opportunity for shared projects of governmental and commercial actors.

The involvement of private actors offered efficient and low-cost projects. On the other hand, the willingness of states, especially the USA, to invest into space, was not the same as during its competition with the USSR. New Space, therefore is characterized by massive commercialization, the increased activity of private actors and willingness to work on risky

projects. New state actors with ambitious plans emerged on the scene, especially China, ESA and India. While private actors dominate to low Earth Orbit (LEO), particularly with satellite constellations like Starlink or SpaceX, deep space missions remain in the agenda of national states (Paikowsky, 2017).

Elon Musk has had a big impact on the space program of the USA. That is because NASA's budget has been considerably lowered. Cooperation with SpaceX also allowed the United States to get rid of its dependency on Russian Soyuz rockets launched from Baikonor. That is because SpaceX's rocket Falcon 9 enables repeated launches, pushing the total expenses down. This is one example of many in terms of how private actors influence the political sphere of space. SpaceX will be an important part of NASA's Artemis mission, as it is developing a Starship taking part in bringing mankind back to the surface of the Moon. Later, it should bring the first humans to Mars. That would once again influence the position of the United States, hence private space companies have a big impact on the prestige of individual states and are intertwined with national strategies. Besides SpaceX, there are other important actors. Jeff Bezos of Blue Origin is designing a new space station called Orbital Reed for United States Orbital (Davenport, 2022).

The increasing number of satellites and their decrease in size characterizes the New Space. Satellites have implications for the military domain as well. Although military satellites have absolute priority in terms of security, because their elimination would make great powers vulnerable, civil satellites must have appropriate security too. Thousands of small satellites represent a big threat when colliding with space debris. This space debris is flying around the orbits in high numbers - NASA tracked more than 27,000 pieces of space debris in 2021 (Garcia, 2021). There are supposed to be around 3,000 dead satellites and thousands of pieces smaller than 10 cm (Marshall, 2021).

Small pieces of space debris are more difficult to track and can lead to increased danger for functional satellites or even the International Space Station, because of the high speed. Therefore, states must run the Space Situational Awareness (SSA) programs carefully monitoring movement on the orbits. SSA examines "the parameters of operational spacecraft—in essence, their function or capabilities, shape, and composition" (McCormick, 2015).

All of that can lead to a chain reaction, creating a huge amount of space junk damaging satellites of all actors. Former NASA scientist Donald J. Kessler proposed the worst-case scenario in his theory of Kessler syndrome from 1978, the cascade reaction would create such a huge amount of space debris that it would be very difficult to continue using satellites at LEO. Launches

going past LEO would still be though. To sum this up, the main features of New Space are increasing dependence on space for both the civil and military sectors, rising commercialisation with a bigger role of private companies, new state actors breaking the space dominance of the USA and USSR during the Cold War, bigger interstate cooperation, dual-use technologies, high number of small satellites leading to risk of collisions and the creation of space debris.

3. Space as an operational domain

In December 2019, NATO officially announced that space joined land, sea, air and cyberspace as NATO's fifth domain. War is constantly evolving alongside available technologies and space has been connected to the military sphere for decades. In fact, the first widespread use of satellites fostering communication, intelligence and precision strikes came in the Gulf War in 1991 (Greenemeier, 2016). The increasing importance of space for NATO defence and deterrence led to the need for a new approach. "We have declared space an operational domain for NATO, recognising its importance in keeping us safe and tackling security challenges, while upholding international law.", NATO leaders stated at the December 2019 Leaders' Meeting in London (NATO, 2019).

NATO's Space Policy was released in 2019. The strategy is set to ensure integration and interoperability of allied assets, with emphasis on these assets as enablers of NATO operations, rather than focusing on capabilities related to targeting space assets of the adversaries. That is because building the alliance's own offensive capabilities could lead to inevitable conflict in space (Sticking, 2020). Thousands of satellites belong to the Alliance members and could become a target because of the advantages that satellite assets provide in modern conflicts (NATO, 2022). State actors such as China and Russia have developed and tested a wide range of counter-satellite capabilities. These tests led to an increased perception of threat from the side of NATO. Despite that, NATO claims that its policy fully follows international law and there is no intention of weaponization.

In 2020, NATO's Space centre was established at Allied Air Command in Ramstein, building up capabilities to provide direct space data and services to NATO commanders. 2021, saw an announcement of plans for a new SSA system at the NATO headquarters. Space has been integrated into NATO's training and exercise structures, operational planning, and development plan supported by the technological sector. Furthermore, NATO is planning to invest over 1 billion EUR into satellite communications in the period 2020-2034 (NATO, 2021). Finally, it has been officially stated that attacks in the space domain could lead to the activation of the Article 5 on common defence. The decision to activate the article would be made on a case-by-case basis (NATO, 2021).

Aside from recognition of the domain by NATO, another significant step has been creation of the Space Force by the United States. The Space Force has been established as the sixth branch of the United States Armed Forces. It has originally been part of the Department of Air Force. The related presidential memorandum start with the sentence "Space is integral to our way of

life, our national security, and modern warfare." (Presidential memoranda, 2019). Benefits are massive communications, financial and economic information networks, public safety, weather monitoring, and military technologies (Raymond, 2020). The presidential memorandum continues by stating the threat coming from the development of space capabilities of the adversaries, capable of denying the use of space to the United States and their allies in times of crisis or conflict. The US Space Force's task is to train and equip forces, which will support both offensive and defensive operations in space, enhancing the effectiveness of the Joint Force. The mention of offensive capabilities is different from the NATO strategy, because NATO operates more as a defence alliance.

An official doctrine for the US Space Force released in 2021 speaks about the acquisition and projection of "space power". Military space power is "the ability to accomplish strategic and military objectives through the control and exploitation of the space domain" (Raymond, 2020). Application of space power must serve diplomatic, informational, military, and economic purposes. Space exploration fosters international relations through cooperation on common projects.

Moreover, it creates unique opportunities for the private sector. The doctrine puts emphasis on Joint Force. Space as a military domain is different from the traditional ways though. It is the only physical domain capable that can achieve global persistent and legal overflight of any place on Earth, which is crucial for military capabilities – command and control, intelligence, synchronisation of manoeuvres, force sustainment, information, and range of fires (Raymond, 2020). Therefore, space power becomes global. Operating on orbital levels reduces the adversary's possibility of launching a surprising attack (in a tactical and strategic way). A complex understanding of lines of communication and key orbital trajectories is a key to success.

Space is a multi-domain. In other words, an action targeting one segment of space capabilities can neutralise the ability to operate in space. The US Space Force divides the space system into 3 segments (Raymond, 2020). Firstly, there is an orbital segment including all spacecraft beyond the Earth's atmosphere. Secondly, a terrestrial segment with terrestrial assets needed for spacecraft to successfully operate in the domain. Thirdly, the link segment consists of signals in the electromagnetic spectrum connecting the first two segments.

There are 3 main responsibilities of the US Space Force based on the doctrine. First of all, preserving freedom of action in the space domain. That is necessary for national interests. No country should prevent access to space for spacecraft of all use. Second, joint lethality and

effectiveness must be enabled, as all domains rely on each other. Lastly, independent opinions advancing the nation's security and prosperity shall be provided by the US Space Force (Raymond, 2020). Big aspects are deterrence and coercive power, which allow one to accomplish objectives without the use of hard power. There is not a big difference from other domains in this sense as other actors can be intimidated solely by their military potential.

The doctrine also mentions the necessity of security cooperation with other responsible partners, determined to maintain the space domain accessible and secure for all. Therefore, there is a big space for alliances or military partnerships, especially within NATO (Raymond, 2020). States do realise the unique nature of space, since irresponsible behaviour can have far-reaching consequences for all actors operating in the domain, including the aggressor.

Besides NATO and the USA, France was another major actor to create Space Command in 2019, contributing to the national space policy and recognized space as an independent domain. In 2021, the United Kingdom followed with its creation of the Space Command. Space Command is organised under the Royal Air Force, unlike the French one combining air and space domains in the French Air and Space Force.

Russia also sees the importance of space as a military domain. To support space capabilities, Russia recently reorganised space, air defence and missile defence capabilities under one command (Harrison et al., 2021).

The Chinese government also recognizes space as a military domain and governmental documents mention the need of gaining space superiority Official Chinese analysis of US space capabilities conducted by the People's Liberation Army suggest that the US satellites and other sensors should be targeted to blind and deafen the enemy (Weeden&Samson, 2021). To achieve that, development of both defensive and offensive capabilities is encouraged.

What do these acts have in common? After examining official policies, doctrines and public speeches, we can see a common trend, mentions of a need for protection against hostile intentions within the domain. Recent events concerning anti-satellite weapons led to an increased sense of threat. With the increasing importance of space both for the civil and military sectors, it became necessary to pay bigger attention to space security. To better organise, equip forces and cooperate with allies in the domain, it was appropriate to officially recognize the domain, set aside a structure responsible for the task, and define general norms and goals to follow.

4. Anti-satellite weapons

Increased focus on space security and space as a new military domain has been influenced by the rising threat of anti-satellite capabilities possessed by several actors. Particularly, there were several major events – ASAT test of China in 2007, USA 2008, India 2019, Russia 2021. However, there were different consequences regarding the influence on the space environment, as Chinese and Russian tests were much more dangerous regarding space debris, all these events contributed to the attention paid to the domain and problematics of ASAT weapons. Tests also led to international criticism from the major space powers and intensified calls for the creation of space norms (Foust, 2021).Nonetheless, there are not any widely accepted norms of behaviour regarding ASAT tests yet.

When describing space force operations targeting adversaries, it is important to distinguish between offensive counterspace operations and ASAT weapons. Use of ASAT weapon is only one possible option, as there are more space related targets within the domain. US Air Force defines offensive counterspace operations as "operations that are undertaken to negate an adversary's use of space capabilities, reducing the effectiveness of adversary forces in all domains" (U.S. Air Force, 2018). Shabbir and Sarosh identify 6 specific targets for offensive counterspace operations – 1) active satellites, 2) ground stations and facilities, 3) cyber and electromagnetic links, 4) launch sites and setup, 5) command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) facilities, 6) third-party providers (Shabbir&Sarosh, 2018).

When it comes to ASAT weapons, Space Threat Assessment divides them into four major categories – kinetic physical, non-kinetic physical, electronic and cyber (Harrison et al., 2021). Kinetic physical ASAT weapons aim to damage satellites via a direct hit or by detonating warheads near the target and can be differentiated by way of leading attack. Direct-ascent kinetic physical ASAT weapons are launched from Earth using suborbital trajectory hitting the satellite on its orbit. Co-orbital kinetic physical ASAT weapons are first placed into an orbit and later used to hit the target. Nevertheless, the co-orbital type of ASAT weapon would make little sense because of economic difficulty and the complex physics of the domain. It would be much easier to hit the ground structures from the Earth (Hitchens&Johnson-Freese, 2016). Finally, there are ground station kinetic physical ASAT attacks cover assaults on terrestrial command and control sites responsible for satellites.

The advantage of a kinetic physical ASAT weapon is demonstration of power, but the impact usually creates a big amount of space debris, putting human lives in danger. So far, none of

state has used kinetic physical ASAT against satellites of other states. This kind of weapons is much more challenging regarding expenses and scientific expertise, only allowing big powers to build capacities, unlike electronic and cyber means (Shabbir&Sarosh, 2018). Nevertheless, despite the recent development of the kinetic physical ASAT weapons, arguments can be made that they are more about deterrence and power projection, than real use in a conflict (Stickings, 2020).

Non-kinetic physical ASAT weapons target satellites without physical contact, but they are not means of electronic or cyber warfare (Harrison et al., 2021). Those can be lasers used for blinding sensors on the satellite or aiming at certain components causing them to overheat. Such a system would have to be of high beam quality, adaptive optics to its make way through the atmosphere and have a good pointing control system for a precise strike. This high-tech option could be operated from ground, ship, aeroplane or other satellite. Second option is a high-powered microwave (HPM) weapon used to disrupt or destroy the electronics of the satellite. HPM attacks aim at the antennas of satellites or at the satellite casing, for instance back door (Shabbir&Sarosh, 2018). ASAT weapons based on laser or microwave technology can be also called directed-energy weapons (DEW). Third, nuclear weapons detonated in outer space would lead to high radiation and electromagnetic pulse affecting all satellites on the orbits.

Electronic anti-satellite attacks focus on the electromagnetic spectrum as a target. That is what satellites use to transmit and receive data. There are two basic forms of possible attack – jamming and spoofing. Jamming is based on interference to signals sent by satellites on the same frequency (INTERTANKO, 2019). Transmitting going in both directions from the Earth to satellite and vice versa can be attacked. Jamming can be further divided into uplink and downlink. Uplink jamming influences all users in the satellite reception area, while downlink jamming has a localized effect because it targets ground assets including the recipients (Defence Intelligence Agency, 2019).

“Spoofing” is the provision of fake signals, transmitted locally and made in order to make the receiver believe it is the real signal. That can be used for putting fake information into a data stream, or cause disruption of satellite operations. There is a special type of spoofing called “meaconing” allowing it to spoof even military satellites (INTERTANKO, 2019). The advantage of an electronic attack is reversibility as the device can be easily turned off to stop interference. Also, there is a problem with attribution, as it gets difficult to determine where the attack comes from and if it is not just an accident caused for example by poor weather conditions. Moreover, these techniques are relatively cheap, hence they can be used even by

non-state actors. Particularly civilian communication satellites remain relatively vulnerable to the threat of jamming and spoofing (Shabbir&Sarosh, 2018).

The last category of possible anti-satellite actions are cyberattacks targeting data flowing between the Earth and satellite and the systems controlling this flow (Harrison et al., 2021). Cyberattacks can intercept data traffic and insert fake information into adversary systems. Targets are both on ground and on orbits. Once again, this type of attack gets relatively cheap, although advanced skills are needed. Attacking GPS for example would have far-reaching consequences, as attacks could send commands leading to the permanent damage of satellites or seriously damage electronics and sensors (Harrison et al., 2021). An attack could also be aimed at Space Situational Awareness assets monitoring the space environment in order to avoid collisions. Sensors, central databases, or data stored at the operation centre could be targeted. Warning for collision might be concealed, or data could be manipulated to waste fuel (Pavur&Martinovic, 2019).

Not only state-actors but also organised crime groups or individuals might be capable of conducting cyberattacks. Cyber-attack capabilities are more widespread than technologies allowing orbit launches, therefore states without space assets might have less restraints to use them (Pavur&Martinovic, 2019). In addition, attribution becomes a problem as an attacker can easily conceal his or her identity. Also, there is a smaller risk of retaliation than in the case of a physical attack. All that increases the danger possessed by smaller state actors. Lastly, unlike kinetic attacks, destroying satellites by using electronic or cyber means of warfare might not trigger article 5 (cyberspace still remains one of NATO's operational domains though) about common defence because this kind of grey activity is seen in other domains too, which could be seen as another advantage from the Chinese or Russian perspective (Stickings, 2020). That makes cyber-ASAT weapons difficult to deter (Pavur&Martinovic, 2019).

Because of the dual-use nature of space technologies, there are many possible ways for attacking a satellite. For example, many state actors are working on solutions for removing space debris. Most technical approaches for active removal of space debris have potential use as ASAT weapons (Atlantic Council, 2016). This dual-use nature of space, where every little piece can irreversibly damage space infrastructure, only adds to the complexity of the domain. Secondly, orbital services made by the commercial sphere for refuelling and cooperative inspection in case of technical issues could serve for hostile intentions. The associated systems would be used for docking, mooring, damaging or displacing the satellite (The French Ministry for Armed Forces, 2019).

Furthermore, the manoeuvres of satellites present a danger of their own. The Security World Foundation paper describes potentially harmful acts originating from bringing 2 satellites intentionally close together as Rendezvous and Proximity Operations (RPO) (Martin,Pfrang,Weeden, 2021). During proximity operations orbital manoeuvres take place to ensure the vicinity of another satellite in order to complete special tasks. When on the same orbit, a rendezvous manoeuvre can be performed, which could lead to a docking (the joining of 2 separate satellites). Satellites can be moved into collision course with another satellite, which would have to do an escape manoeuvre to avoid a crash, every such action could waste valuable fuel. Another possibility is to move or turn satellite around in a way preventing their functioning. These capabilities could be used for intelligence or reconnaissance missions. Space powers are actively developing these technologies which are of dual-use nature as well, because orbital manoeuvres can be used for on-orbit inspections, repairing or refuelling.

4.1 ASAT capabilities of key actors

4.1.1 China

China stands behind the first successful demonstration of ASAT technology during the test of Chinese kinetic-energy ASAT destroying a weather satellite in 2007. The consequences were 3,000 larger pieces of space debris possible to track back in time and tens of thousands of smaller pieces endangering satellites and even the human crew on the ISS (Krepon&Thompson, 2013). That was the first major event that brought the problem of ASAT weapons related to space debris on the table. The 2021 Space Threat Assessment states that China has a robust direct-ascent system SC-19 that has already been tested (first known tests in 2005 and 2006, before the use on the satellite) and dual-use assets that are necessary for ASAT weapons on orbits. However these weapons could target any satellite on all available orbits. Their ability to hit targets beyond LEO remains to be questionable (Weeden&Samson, 2021). On the contrary, the Space Threat Assessment report states that Chinese direct-ascent ASAT capabilities can likely threaten satellites placed on MEO and GEO as well (Harrison et al., 2021). Despite all that, China never officially acknowledged the existence of these programs since the ASAT test in 2007 (Defence Intelligence Agency, 2019). Non-physical kinetic capabilities include directed-energy weapons via a laser basis that could counter space-based sensors on LEO.

Furthermore, China has got electronic and cyber counter space capabilities allowing for the targeting of the Global Navigation Satellite System (GNSS) and satellite communications (Weeden&Samson, 2021). Jamming is becoming a part of Chinese military exercises and assets in development could therefore be able to attack military reconnaissance platforms including satellites on the LEO (Defence Intelligence Agency, 2019). In general, China puts emphasis on cyber warfare means and has taken steps to integrate space, cyber and electronic warfare units under one joint command. Although there are no publicly known cyber-attacks from the side of China against satellites of other nations, Chinese cyberattacks in other domains such as the financial one proves its cyber capabilities.

When it comes to the dual-use technologies that could be possibly used as a weapon, Chinese Tianjin University is developing a robot trained to grab debris and deorbit it, which could be used against American satellites in theory (Harrison et al., 2021). Moreover, China works on technologies enabling satellite inspection and repair could be misused for an attack on a satellite as well (Defence Intelligence Agency, 2019). China also conducted several tests of RPO capabilities in LEO and GEO orbits. That could lead to co-orbital ASAT capability

(Weeden&Samson, 2021). RPO tests have been conducted on several occasions, practising operations with other Chinese satellites (Harrison et al., 2021).

4.1.2 Russia

Russia used ASAT weapons on one of its own satellites in November 2021, once again creating a huge number of debris, counting to 1500 detected pieces (Paikowsky, 2021). Their motivation seems to have been an attempt to demonstrate space capabilities and enforce deterrence (Paikowsky, 2021). Once again, the action was condemned by the West which spoke of irresponsible behaviour.

Besides the direct-ascent capabilities, Russia was accused of conducting a co-orbital ASAT test in 2020 by the USA (Harrison et al., 2021). Combination of two satellites, one hidden inside another and then shooting small projectiles at the target was used. The same technology could be used for targeting satellites of other nations, therefore the USA raised concerns.

The 2021 Global Counter Space Report states that, “There is strong evidence that Russia has embarked on a set of programs since 2010 to regain many of its Cold War-era counter space capabilities” (Weeden&Samson, 2021). The first co-orbital Soviet ASAT test happened in the 1960s and contemporary Russian programs are building on these capacities (Harrison et al., 2021). Furthermore, Russian air and missile defense systems could likely reach satellites in LEO. It is believed that the latest system S-500 might be capable of that (Harrison et al., 2021).

There have been tests of RPO capabilities in LEO and GEO orbits, which could lead to co-orbital ASAT weapons just like in the case of China. However Russian RPO could allow non-aggressive applications such as surveillance of foreign satellites, evidence suggests that some of Russia’s LEO RPO activities might be weapon based. Also there are links leading to Soviet program testing LEO co-orbital ASAT. Russia seemed to be capable of conducting only limited direct ascent ASAT (DA-ASAT) operations until the creation of the new DA-ASAT capability of the Nudol system that was used for the ASAT test in November 2021.

Russia also puts emphasis on electronic means of fight and modernizes these capabilities (Weeden&Samson, 2021). Jamming of user terminals within tactical ranges is one of its priorities. However Russia is able of jamming GPS receivers in a particular area using mobile EW (electronic warfare) systems, there is no publicly known capability allowing it to target the GPS satellites. Hence the targeted assets could be, for example, guidance systems of military vehicles, guided missiles, and precision guided munitions, but also the satellite communication channels. The capability of jamming is well trained thanks to the recent conflicts and exercises.

Cyber-attacks are then frequently practiced in Russia, as is demonstrated by the cases of the SolarWinds hack in 2020 or NotPetya in 2017 (Harrison et al., 2021). Russia also might be developing high power-space based laser weapons. It was publicly announced in 2021 that the current laser system Peresvet would be also attached to an aircraft carrier.

4.1.3 The United States

In 2008 Pentagon conducted a similar test to China's a year beforehand using sea-based ASAT to take down an old intelligence satellite. The target was also chosen with the intent to minimalize the amount of created space debris, because it was hit in much lower orbit than during the Chinese test in 2007 and therefore most of the debris had an extremely short orbital lifetime (NASA, 2008). However, The United States did not acknowledge possession of DA-ASAT capability, such a capacity has been developed by the US in the past (Weeden&Samson, 2021). Also, the United States have tested operational midcourse missile defence interceptors in a test against ASAT weapon targeting satellite on the LEO.

When it comes to the RPO abilities, USA conducted several tests in both LEO and GEO together with tracking, targeting and intercepting (Weeden&Samson, 2021). Although the technologies have been developed for needs of missile defence, on-orbit inspections, or maintenance of satellites, all of that could lead to creation of co-orbital ASAT capability. Such capability could be prepared in a short amount of time.

Furthermore, there is an electronic warfare offensive counterspace system in operation, working under the name the Counter Communications System (CCS). The capacities allow for the jamming of global navigation satellite services including Russia's GLONASS and China's Beidou in the local area of use. That has been proven by several military exercises. The Global Counterspace Report also states that the USA most likely has capacities that enable the jamming of military GNSS systems as well (Weeden&Samson, 2021).

However there is no proof of successful operationalisation, there has been focus on research and development of high energy lasers that could be also used as a counterspace asset (Weeden&Samson, 2021). The low power lasers could then blind imaging satellites. Finally, the US also has advanced capabilities in the cyberspace.

4.1.4 Other actors

India is the fourth nation that displayed kinetic ground-based ASAT capability. The direct-ascent ASAT test happened in 2019 and was conducted at a low altitude to minimize the amount of debris. The Defence Space Research Organisation (DSRO) created in 2019 is also working

on the development of directed energy weapons and co-orbital ASAT capabilities. In addition, missile defence and long-range ballistic programs could lead to the creation of co-orbital ASAT weapons (Weeden&Samson, 2021). Lastly, electronic capabilities include advanced jamming such as systems like the ground vehicle based Himshakti, which allow for the jamming of satellite frequencies over an area the size of about 10 000 km (Harrison et al., 2021).

Iran is still developing its own space capabilities and trying to overcome technical difficulties, but the successful launches of satellites placed on orbits in 2020 and 2021 suggest that the country could be close to acquiring direct-ascent kinetic ASAT weapons (Harrison et al., 2021). That could be potentially dangerous especially because of the threat of space debris. It is unlikely that Iran could develop co-orbital ASAT capabilities in the near future though. Use of jamming against drones and radar units demonstrated EW capabilities. However, Iran might not be able to jam military satellites (Weeden&Samson, 2021). Iran also has been accused of GPS circle spoofing. This is a type of attack that signal transponders to send various erroneous positions. Cyber realm abilities were used especially against targets in Israel.

North Korea never demonstrated possession of kinetic ASAT weapons and it is believed that there is no such technology available for the country (Harrison et al., 2021). However, the test of a solid-fuel intercontinental ballistic missile (ICBM) in March 2022 indicated that North Korea may develop direct-ascent ASAT capability. Nonetheless, there are no means to guide the rocket, therefore the only danger for other states could arise from creating a lot of space debris. North Korea frequently exercises downlink jamming particularly against civilian satellites on the peninsula. It is believed that the biggest threat is the cyber unit called Bureau 121 consisting of more than six thousand members (Weeden&Samson, 2021). Although there is no evidence about attacking satellites in the past, they could potentially become a target.

5. Application of offensive realism on outer space

In this part I will apply theory on outer space as an operational domain, following my research question “Is it possible to explain motivation and behaviour of state actors in space through the logic of offensive realism?” It is important to mention that my work is focusing on the present state of domain, including real actions and capabilities until now such as ASAT tests. The goal of my thesis is not to use offensive realism to predict how the future war in space might look like. That is also why I will not speak for instance about valuable space resources and space mining, which could possibly become a big aspect in the future and lead to contests in space, but the current state of technologies does not make it relevant for the needs of my thesis.

Mearsheimer’s offensive realism is based on his book The Tragedy of Great Power Politics written in 2001. Therefore there is no mention of space (nor cyberspace) as a military domain. However, Mearsheimer’s five basic assumptions about the international system can be applied to space too. Firstly, the state of anarchy can be explained through independent states with no central authority competing in the system, based on insufficient state of relevant legislation and internationally recognized norms. Most contemporary space law was based the 1967 Outer Space Treaty (Marshall, 2021). The document has been written considering technologies at that time and contains vague definitions like “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" (Committee on the peaceful uses of Outer Space, 1967). Therefore, the Outer Space Treaty does not reflect for example the importance of the Lagrange points (Starling&co., 2021).

Secondly, there are indeed offensive military capabilities as shown in the chapter on ASAT weapons. Thirdly, the dual-use nature of space technologies only adds to the uncertainty about intentions of other actors, as for example spacecraft used for removing space debris might be used for damaging satellites of the enemy. The uncertainty blends into other domains as well. For example, states like Iran or North Korea have been repeatedly accused of using space programs to cover their development of ballistic missiles that could be used against terrestrial targets (Harrison et al., 2021). Fourthly, the goal of survival still remains valid. To achieve that, states have to conduct simultaneous operations across all domains, as the American Doctrine for Space Forces suggest (Raymond, 2020). A functional deterrence is essential for securing survival. For deterrence to work, there must be secure retaliatory capabilities capable of denying the advantage to the attacker, situational awareness and attribution capabilities for correct identification of the perpetrator (Krepon&Thompson, 2013). Lastly, theory assumes that the

actors are rational. That can be seen for example in perception of threat resulting from space debris created by irresponsible tests of kinetic physical ASAT weapons.

The core of offensive realism is the maximization of one's own power and at the same time weakening the rivals. Therefore, Mearsheimer perceives power as a zero-sum variable (Mearsheimer, 2001). One actor has to lose, in order for another one to gain. How can this be achieved in outer space? In space, just like in other domains, one can find certain features of great strategic value, and of limited availability, which may lead to competition over their possession. In other words, their control increases the power of the owner and decreases the power of other nations, whose security would in turn be placed under bigger threat. These are the important orbits and orbital points, the terrestrial points related to space launches and radio frequencies.

First of all, LEO is the most strategically important part of the space domain. That is because of the connection to the terrestrial domain. Placing satellites on LEO requires less launch energy and therefore is cheaper (Starling&co., 2021). Furthermore, the proximity of the orbital Zone to Earth enables the production of sharper images and communication with lesser latency in comparison to assets placed in GEO. Because of faster orbits, satellites pass over same spot more frequently. Thus, LEO is particularly significant for the needs of the military on the ground. Satellites on the orbit make communication possible and also support C4ISR capabilities such as battlefield imagery. LEO is also necessary for the rapidly growing commercial sphere with satellite mega-constellations of private companies coming soon. Combination of military and civilian satellite structures was leveraged in The U.S. Army's Project Convergence in October 2020. Information from the satellites was used to rapidly transmit information about targets (Borowitz, 2022). With the use of data fusion and AI technologies, the Army managed to cut down the sensor to shooter timeline from 20 minutes to 20 seconds (Strout, 2020). This success only underlines the importance of LEO for the military domain. The successful control of LEO by one state could limit access to space for other nations, including the higher orbits as well, therefore LEO might become a cause for potential contest.

The gateway to the cislunar sphere created by the Earth-Moon radius are the Lagrange points. These points are regions in space where two celestial bodies produce increased orbital stability. There are five of them in every orbital system, for example between the Earth and the Sun, but the Earth-Moon Lagrange points are the most important for the needs of our satellites (Starling&co., 2021). That is because placing a satellite at Lagrange point allows it to stay in a

fixed position relative to Earth. That leads to much lower expenses of station-keeping fuel, which not only pushes costs down, but also extends the orbital life of the assets (Starling&co., 2021). L4 and L5 are the most valuable of the Lagrange points because they are stable orbits, while spacecraft located at the other three orbits require periodic corrections to maintain their position. So far, NASA, ESA and China managed to place spacecraft on L1 and L2. Furthermore, USA is planning to place their Gateway orbital station to a halo orbit (periodic, three-dimensional orbit) around the L2 (Kaplan, 2020). Although space is large, there is only a limited amount of spacecraft that can be placed in one orbit. If one great power takes full control of a particular Lagrange point, it might exclude other nations from using it (Starling&co., 2021). Threat of ASAT weapons could be used to deter others from using the orbit.

However, the Lagrange points remain more of a topic for the future, the strategy paper of the Atlantic Council states that they could become chokepoints (Starling&co., 2021). This expression builds on the classical geopolitical theory of Alfred Mahan. Chokepoints were strategic narrow passages and their control contributed to Great Britain's command of the seas (Sempa, 2014). The controller of naval choke points would cut off the enemies from important passages and thus significantly limit their access within the domain. The same can be said about the Lagrange points as achieving dominance on these orbits and preventing others from using them would seriously damage the space programs of other nations. Lagrange points are vital not only for satellites but also for big projects such as space stations (Kaplan, 2020). According to Dolman, domination in space would come through the control of these chokepoints, but the first strategic narrow from Earth is LEO itself (Dolman, 2008).

Besides Mahan's chokepoints, also Mackinder's geopolitical thoughts can be applied on the domain. Mackinder's famous paper The Geographical Pivot of History written in 1904 states that control of Eastern Europe is the key to controlling the whole world (Mackinder, 1904). Whoever controls Eastern Europe controls the Heartland. The owner of the Heartland controls the World Island and who rules the World Island rules the world. This thought has been applied to outer space as well. Dolman states that "Who controls low-earth orbit controls near-Earth space. Who controls near Earth space dominates Terra. Who dominates Terra determines the destiny of humankind" (Dolman, 2002). Although Mahan and Mackinder cannot be considered offensive realists, simply because their theories did not exist back in their time, Mearsheimer bases a lot of his claims on geopolitics, for instance with the argument about great masses of water preventing global hegemony. Therefore, we can claim that space chokepoints are relevant for the application of offensive realism.

Besides Lagrange's points, there are also other advantageous orbits, for example pole-sitter orbits that would allow a satellite using solar sails or a small engine to stay over one of the Earth's poles, in order to observe the Arctic or Antarctic regions (Starling&co., 2021). Great powers might be interested particularly in observing of the Arctic, since this is geopolitically important territory due to its resources and the melting of ice, opening new trade roads (Marshall, 2015). Therefore, control of the pole-sitter orbit might have a significant value for great powers. As in the case of Lagrange points, a successful monopoly of the orbit would not only provide an advantage, but also cut off other powers from acquiring the same capability.

Terrestrial points related to space launches also have big strategic significance (Dolman, 2008). For a satellite to gain orbital velocity required to reach the orbit, orbital velocity must be gained. To take advantage of Earth's rotation for the launch, the object must be launched eastward from as close to the equator as possible (Roberts, 2019). The USA is using the Cape Canaveral in Florida, the spaceport of ESA is in Kourou, French Guiana, Russia is launching from Baikonur in a part of Kazakhstan leased to Russia and a Chinese spaceport can be found in Wenchang on Hainan Island. The locations reveal that all great powers are trying to launch from as close to the equator as possible in the eastward direction. In addition, political geography matters too. For instance Israel built its launch capacities in the east-west direction because of hostile relations with Jordan and Iraq on the eastern borders (Bowen, 2020). Building on the logic of offensive realism, some states could act in order to prevent launching from the sites or destabilise the key areas, because projection of space power is not possible without the ability to successfully launch spacecraft. Similarly, the terrestrial points enabling functionality of spacecraft might become a target, for example the Schriever Air Force Base in the United States which is a key control node of the GPS constellation (Bowen, 2020).

Satellites communicate using the radio frequency (RF) spectrum located in the electromagnetic spectrum (EM), which is the range of all possible frequencies of electromagnetic radiation (Secure World Foundation, 2013). RF energy is identified by frequency (Hertz or Hz) or wavelength (metres). Specific parts of the RF spectrum are called bands, these are for example common FM and AM bands used for radio broadcasting. Each band has its own use with advantages and disadvantages, serving for specific applications allowing for the functioning of different kinds of satellites. While military satellites use extremely high frequencies ranging from 30 to 300GHz, satellites used for weather radar or air traffic control use super high frequencies at 3-30GHz. A regulatory framework has been created with the International Telecommunication Union (ITU) managing the RF spectrum, because it is shared by many

actors. ITU recognized the RF spectrum and specific orbital regions as limited resources that must be used efficiently and allocates frequency bands. Because of the limitation of their usage, certain frequencies become strategically important. There is a limited number of satellites running on each frequency type and with an increasing number of satellites being launched into space, there could be a competition amongst big powers soon. Furthermore, the authorisation given by ITU works on a first come, first served basis, hence some countries might wish to occupy the advantageous frequencies not only for their own purposes, but also to cut off their competitors.

Besides features of the space domain of limited availability, ASAT weapons could shift the ratio of power. Mearsheimer speaks about actual power which is equal to the military strength of state actors and its ability to defeat other actors. Potential power based on the state's wealth is needed in order to acquire actual power. Therefore, states should try to strengthen their economic power, which in turn would allow them to develop ASAT weapons. The capability of destroying other satellites is the key for controlling the domain. So far, we can speak about the state of deterrence based on demonstration of ASAT technologies, especially the kinetic physical ASAT weapons. But no state can be sure of another state's intentions, therefore the strategic calculus calls for developing the ability for its own defence. As Mearsheimer says, the anarchic nature of the international system dominated by fear of one's neighbours and willingness to maximise one's own power would eventually push states into offensive actions.

Referring to Dolman, each domain must be conceptually separate with its own strategy based on its unique features (Dolman, 2012). As for space, the purpose of military space power would be to control space. The military must be able to control the domain so that it can use it if the state is planning to operate in space in times of conflict. Space assets ensure this need, because every state wants to defend its own spacecraft. If states are unwilling to place weapons into space, then they cannot hope to control it when other states contest the domain. In other words, denying oneself the capacity to put military power into space is equal to giving up on the military and probably also the civil value of space. Using this logic, we can predict that statse are likely to have no choice when it comes to developing ASAT capabilities, if they want to acquire space power.

States are also capable of cost and benefit analysis before making a decision on offensive action. In the space domain, there are many extra factors that need to be taken into account, when compared with the traditional domains of land or maritime. For example, kinetic physical ASAT weapons bring with them a risk for the state's own spacecraft, because of space debris.

There could even be far-reaching consequences preventing the use of the whole domain for every actor in case of the Kessler's effect. A zero-sum game could then turn into negative-sum game in which all of the actors lose, and nobody gains. Hence, states attempting to maximise power in the space domain would have to be very careful about this danger. Nevertheless, China and Russia did not hesitate to demonstrate their ASAT capabilities, creating thousands of space debris pieces. That corresponds with Mearsheimer's claim that states are revisionist rather than status-quo power seekers (Mearsheimer, 2001). Because no state can be sure about the intentions of other states, states choose to act. Even if states cannot achieve total control of the domain, they act in order to gain additional increments of power, because every maximisation of power counts.

Offensive realism also speaks about the final goal of hegemony. Mearsheimer states that it is extremely difficult to achieve the state of global hegemony, thus states instead pursue the goal of regional hegemony (Mearsheimer, 2001). What are the implications of this hypothesis on the space domain? Partial space hegemony might mean the control of one particular orbit, for instance LEO. That would not result in a total dominance within the domain though, unless the state controlled MEO and GEO as well, including all the Lagrange points. Attempts for partial control would be in accordance with the theory, as states shall maximise power at the expense of the rivals whenever possible. Nonetheless, achieving hegemony in the contemporary state of the space domain would be extremely difficult. Current technologies do not allow the equivalent of global hegemony on Earth. However, an equivalent to regional hegemony could be the control of communications leading to the Moon, including the first Lagrange point.

Regarding state's behaviour, Mearsheimer speaks about the tendency of states to buck-pass rather than balance in order to defend the balance of power when it favours them (Mearsheimer, 2001). Alternatively, states choose to lead war or blackmail when the balance of power does not favour them. Using all these strategies with respect to the situation in the international system can be expected from all great powers in outer space, based on the theory of offensive realism.

When it comes to polarity within the international system, Mearsheimer mentions that multipolar systems are naturally more war-prone, especially if they are unbalanced and hence consist of more potential hegemons with power ambitions (Mearsheimer, 2001). That is valid also in the case of space, as there are several actors with ambitious space programs and more or less developed ASAT weapons – USA, Russia, China, India. That adds to uncertainty. Also as the non-existence of space law suited to the state of contemporary technological progress.

5.1 Limits of the theory

Dolman speaks about hegemony in space using Mackinder's theory based on the control of the Heartland and Mahan's naval theory involving the control of key chokepoints (Dolman, 2002). Building on this analogy, space might be divided into key points providing a significant strategic advantage to the controller, particularly due to the orbital mechanics that determine the access to the orbits and celestial bodies. On the contrary, Bleddyn E. Bowen offers a different perspective, when he speaks about control of the space domain. Referring to his work War in Space, command of space is based on control the of communication and not the conquest of territory (Bowen, 2020). Therefore, it is wrong to assume that dominance or security in space would be gained via presence in space, unlike the naval choke points that must have been controlled with ports and the presence of ships within the domain. Furthermore, the terrestrial space systems directly affect the space environment in a way, not applicable to the naval environment.

The concept of command in space speaks about space denial as the primary objective. This goal can be achieved just with the existence of ASAT capabilities on ground, and it is not necessary to build space infrastructure such as satellite constellations or orbital stations in order to achieve control of the domain. That is because the main purpose of space power is to support the terrestrial forces and denying this capability would seriously limit the benefits of the space domain. On the other hand, denying access to space does not result in the ability to exploit space by oneself. Nevertheless, the value of space must be subordinated to terrestrial political strategy.

Contemporary technologies do not allow for the placement of space-based weapons placed on orbits. However, there were plans for the development of capabilities of this kind during the Cold War. American scientific plans examined the possibility of orbital bombardment systems using kinetic energy as well (Mowthorpe, 2001). Nonetheless, orbital based weapon platforms would face the same vulnerabilities as modern satellites targeted by ASAT weapons. Therefore, it is more advantageous to control orbits from the ground. Because of this fact, the analogy with controlling naval domain once again fails. Thus, a space-centred approach becomes a necessity instead of just mere projecting of strategic environment from other operational domains. Celestial lines of communication, their composition, location, users and effect on terrestrial systems must be taken in account when judging strategic value of space command (Bowen, 2020).

The above stated factors also mean that the strategic thinking of Mearsheimer's offensive realism based on experiences from other domains (especially land and naval power) is not fully

transferable into the space domain. Some of the assumptions might be applicable, but we need to be aware of the unique features of space. Different types of satellites in different altitudes have different tasks and vulnerabilities, therefore the topography of space cannot be compared with naval fleets. Furthermore, Mahan's theory expects states to impose blockade on crucial naval points, acquiring control over the domain. Blockade in orbit would not work the same way, because spacecraft would still be vulnerable towards ground-based counter space weapons. Bowen corrects the analogy by saying that space-based weapons would be like coastal vessels in range of landward weapons (Bowen, 2020). Space would then be coastline rather than vast ocean and Earth-based ASAT weapons would be land-based coastal defences.

Particularly, the connection of the Earth to space plays a major role in the domain, as space serves just as a support theatre for terrestrial actions, and its strategic value shall be seen in this way. Domination in space does not necessarily lead to domination on Earth. That is because control of space as a domain would be useless without the possession of land power. According to Bowen, states seeking hegemony in space would have to achieve hegemony on Earth at first. Mearsheimer's theory states that global hegemony is impossible because of huge masses of water, therefore hegemony in space would be impossible.

However, Dolman speaks about valuable resources in space that would give the controller power to dictate the fate of all terrestrial governments (Dolman, 2008). Bowen says that space power theory must remain practically useful for the needs of contemporary warfare strategy (Bowen, 2020). That once again puts emphasis on the supportive role of space for terrestrial warfare instead of focusing on futurologist wars in space. Because of the connection between space and Earth, we cannot expect that major power would spend vast amounts of resources on space-based weapons and infrastructure instead of investing into the exploitation of strategic command on Earth.

That is because space-based weapons could be targeted with use of counter space weapons on ground. Because of orbital mechanics, all space-based weapons would have to move on predictable orbits which would increase their vulnerability. Furthermore, Bowen states that taking action on the ground against states operating in space might be more beneficial than attacking their space infrastructure (Bowen, 2020). Besides military infrastructure, commercial spacecraft could be targeted or denied access to the domain. However, a space economic war would just be a part of strategic manoeuvre contributing to the overall war.

On the other hand, that does not mean that space could not become the scene of a decisive battle in orbit following decisive action on Earth, since space power significantly affects land power

through early warning, precision, more effective deployment of forces and faster sensor-to-shooter cycle (the amount of time taken from detection of enemy until attack). Space power could also compensate for weaknesses in other areas such as a lesser number of deployed troops. We just have to allow the possibility that control of the space domain does not automatically bring success on ground. Therefore, theorists should be careful when calling space the centre of gravity using the analogy from Clausewitz.

Finally, Bowen discusses potential contemporary conflict in space on the hypothetical example of a Chinese strike against US space assets, following with ground invasion of Taiwan (Bowen, 2020). This example was chosen because it is often discussed as a possible use of counter space weapons given the contemporary international security situation. Bowen applies his theory on two scenarios of a potential Chinese attack (Bowen, 2020). The first one is a so-called "Space Pearl Harbour". In this scenario, China opts for a massive surprise attack against US space structures in order to prevent a potential American response to the Chinese invasion of Taiwan. The intention is to level the terrestrial battlefield by taking American advantage from them. However, this attack would likely mean retaliation from the side of the United States hitting Chinese space assets. That is, because the incoming strike would be difficult to hide since it takes time for missiles to reach the targeted orbits, and it may be complicated to hit all targets in space. China might need to target the terrestrial structures too.

Dispersion can play a big role here as both sides would attempt not to concentrate all power in one area to ensure the possibility of a second strike. The danger for China would not only come from the American ASAT weapons, but also from the Taiwanese counter space capabilities. A surprising attack on US space assets would eliminate the moment of surprise that could be used against Taiwan. Terrestrial attack on Taiwan might be of a bigger priority than targeting the relatively distant US Navy with its supportive systems on orbits. Furthermore, it is in the interest of China to not drag the United States into the conflict on the side of Taiwan, which would the scenario of Space Pearl Harbour most likely do.

Lastly, it might be more advantageous to strike space assets in times of a terrestrial conflict to increase the consequences of loss of the support for the land power. Saving the capacities until the decisive moment and waiting for the action of the United States would be the second possibility for China. Despite some strategic advantage for the latter phase of a conflict, this option risks losing the advantage, because counter space systems are most successful during the first two stages of a conflict – opening gambits and amphibious operations/landing, but not

in a protracted warfare (Bowen, 2020). Both approaches for utilising ASAT weapons have some flaws and it is impossible to predict the reaction of an opponent.

6. APPLICATION OF THE THEORY - TABLE

ASSUMPTION	(NOT) APPLICABLE	EXAMPLE
ANARCHY	APPLICABLE	INDEPENDENT STATES WITH NO AUTHORITY
OFFENSIVE CAPABILITIES	APPLICABLE	ASAT WEAPONS
UNCERTAINTY	APPLICABLE	DUAL-USE SPACE TECHNOLOGIES
SECURING SURVIVAL AS A GOAL	APPLICABLE	SIMULTANEOUS OPERATIONS ACROSS DOMAINS, ASAT WEAPONS
RATIONAL ACTORS	PARTIALLY APPLICABLE	IRRESPONSIBLE TESTS OF ASAT WEAPONS – SPACE DEBRIS
POWER MAXIMISATION	APPLICABLE	ASAT TESTS
HEGEMONY AS A GOAL	NOT APPLICABLE	CAN NOT BE ACHIEVED WITHOUT FULL CONTROL OF LAND
SECURITY DILEMMA	APPLICABLE	ASAT WEAPONS, ASAT TESTS
IMPROVING POTENTIAL POWER (WEALTH)	APPLICABLE	COMMERCIAL USE OF SPACE
STRATEGIES: WAR	PARTIALLY APPLICABLE	SUPPORTIVE ROLE OF SPACE DOMAIN, ASAT WEAPONS USED AS PART OF TERRESTRIAL WAR
STRATEGIES: BLACKMAIL	PARTIALLY APPLICABLE	THREATENING WITH ASAT WEAPONS
STRATEGIES: BUCK-PASSING	PARTIALLY APPLICABLE	DIFFICULT TO APPLY ON CURRENT ENVIRONMENT
STRATEGIES: BALANCING	PARTIALLY APPLICABLE	ONLY AS A PART OF OVERALL POLITICS

Conclusion

To sum up my work, the theory of offensive realism can be partially applied to outer space. The basic assumptions of Mearsheimer about the international system, upon which he builds his theory, remain valid also in outer space, because a state of anarchy full of sovereign states with no central authority, competing in an environment with an unsatisfactory state of internationally recognized norms is present in this domain as well. Also there are offensive military capabilities enabling strikes on satellites, based on more technologies – kinetic physical, electronic and cyber as the most relevant for today. However, we must be aware of the unique features of the domain. Outer space is very different from the traditional domains of land or sea. The environment works with different physics shaped by lower gravity and orbital mechanisms that determine the movement of objects. Satellites travel on predictable orbits and make relatively slow manoeuvres before changing position, which also matters for strategy in a potential conflict. The orbital system can be targeted with use of ground-based counter space system, hence the presence in the domain is not necessary for the control of it. That is why the traditional geopolitical concepts described by Mackinder and Mahan cannot be easily applied. Therefore, we should avoid biases originating from projecting our strategic knowledge from other operational domains.

The impact of space on modern warfare is undoubtedly huge, as it enables communication, navigation, precision strikes or a faster sensor-to-shooter cycle, but its role is merely supportive for ground forces. Achieving sole control in space would be useless without controlling Earth, as demonstrated by the ASAT tests of kinetic physical ASAT weapons fired from Earth creating large amounts of space debris. Furthermore, irresponsible ASAT tests could lead to the Kessler syndrome, when chain reaction caused by created space debris destroy most of the spacecraft on orbits, making them inconvenient for launches for a long period of time. This way all actors would lose.

Mearsheimer states that the final goal of all states is to secure a survival by achieving a hegemony (Mearsheimer, 2001). A state cannot become a hegemon in space without becoming a hegemon on Earth, which is according to Mearsheimer, impossible due to geographical obstacles. Yet, states still try to achieve regional hegemony. In the case of outer space, the equivalent to regional hegemony would be a control over strategically important points in the space topography. The first goal and the most important point is LEO (Dolman, 2008). In the future, the contest might include the Lagrange points, for instance L1 which provides access to the Moon. Apart from that, there are advantageous radio frequencies of limited availability to

run communications with satellites onto and significant terrestrial points related to the launches. According to the theory, states seek to maximise their power even if acquiring hegemony is not possible for them and every action that twists the balance of power counts. Therefore, these space-related resources of limited availability should become subject to competition. Nonetheless, their possession would only be valuable as a contribution to land power, hence states would only maximise power in space if it fitted their strategic intentions on ground.

According to Mearsheimer, states also pursue other goals, besides power maximisation and hegemonic intentions, for instance increasing wealth (Mearsheimer, 2001). Thus, space is also relevant for commercial activities involving big private companies. However, the theory states that wealth as a potential power becomes crucial for acquiring the actual power, which is equal to the military. Furthermore, space technologies can be of a dual-nature use, meaning that even civilian assets might be used for hostile intentions. For instance, the proximity operations of commercial satellites. That only contributes to the security dilemma as perceived by space powers.

All things considered, the option of conflict in space is limited because of the contemporary state of ASAT weapons, problems related to space debris and questions about strategic impact. To illustrate that, an example of a Chinese move against Taiwan was introduced. Use of counter space weapons in the early phase of conflict against US satellites would take away China's strategic advantage against Taiwan. On the other hand, striking too late could reduce the effectiveness of ASAT weapons. Therefore, the use of ASAT weapons would have to be precisely timed in order to match the advance on ground. However, strategic perceptions of the United States and Taiwan could spoil such a plan. Moreover, any use of counter space weapons would mean a risk of retaliation from the American side. All these obstacles for conflict in space reveal that war, which is perceived as the most rational strategy for power maximising and survival by Mearsheimer, might not always be the best option. War in space would serve as a part of an overall campaign and has to support the terrestrial goals. Besides that, other discussed strategies of blackmail, balancing and buck-passing are difficult to apply to the contemporary situation in the domain. Hence, assumptions about the behaviour of states in offensive realism can be applied only partially, with regard to the future, as well as the theory as a whole. That also answers the research question - "Is it possible to explain motivation and behaviour of state actors in space through the logic of offensive realism?". Offensive realism can explain the behaviour of space powers only partially and the application has its limits.

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