

THE ROLE AND IMPACTS OF SPACE TECHNOLOGY IN THE TRANSFORMATION OF CONFLICTS

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Abstract

The study examines how space technology has transformed conflicts and, more recently, what kind of gains space technologies have provided in conflicts. The study has been prepared within the framework of historical analysis, comparison, technological impact analysis, and an interdisciplinary approach. The study presents the evolution of conflict from the past to the present and how inventions and technological advances have diversified conflict tools, actors, and effects. The study also focuses on how space technologies have contributed to conflicts, the defence-based impacts of space technologies, and the support they provide to conflicts. Space-based technologies substantially enhance national defence and ensure security in both terrestrial and extra-terrestrial domains. These technologies facilitate advanced intelligence acquisition, contributing to strategic deterrence and bolstering defence frameworks. However, they simultaneously expose critical infrastructures to heightened vulnerabilities, as potential adversaries could target space assets. The militarization of space introduces a dual-edged dynamic, where the advantages of strengthened defence are tempered by emerging risks that necessitate comprehensive governance and mitigation strategies to maintain global security and prevent escalation.

Keywords: *International Relations, Conflicts, Space Technology, Impacts*

Introduction

History has witnessed thousands of conflicts between states. The means of conflict have changed according to the conditions of the period, but conflicts have always existed. It is difficult to imagine a world without conflicts, as states see it as a legitimate right to engage in conflict to protect their national interests. Since no balance is entirely

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satisfactory to all parties concerned, no balance can last forever, and every balance is vulnerable.¹ It is an unexpected phenomenon that all parties come together on common ground, it can be said that conflicts will continue to be among the mentioned issues for a long time.

As conditions change and humanity continues to develop, the size, impact, tools and damage caused by conflicts have grown. The introduction of new technology in the political, social, or economic spheres may also mark the beginning of change, which gradually alters the dominant mindset.² Humanity has developed in technology, but the same development has not been as advanced in inter-state relations as it has in technology. While technology brings about various changes and conveniences in many areas, particularly in political and social life, its impact extends far beyond these spheres. From the invention of the steam engine to the present day, information and communication technologies have significantly influenced global politics, fostering more intense dialogue and cooperation between states on a variety of issues. These technological advancements have not only facilitated international collaboration but have also contributed to the evolution of conflicts, pushing them into new dimensions.

In recent years, space-based technologies have come to the forefront to strengthen the states' defence. Space technologies that gain functionality in connection with satellites provide various opportunities to the parties in conflict. While conventional power is gradually losing importance in terms of military equipment, such as the number of soldiers and tanks and rifles, technological advances such as satellite technologies, location detection systems, and remote-control mechanisms are gaining importance. In order to strengthen land, sea and air defences, a state must modernize these defence areas by using space technologies. A defence that is not integrated with space technologies cannot be expected to produce the desired results.

In the field of International Relations, there are numerous studies where space technologies are analysed within the context of security. Due to the increasing influence of technology and its integration with various fields, it has gradually begun to hold a significant place within the discipline of International Relations. Looking at the literature, studies on space technologies and security can generally be categorized into three groups. First, studies focused on whether space will become a new battlefield are prominent.³ Second, there are discussions regarding the

¹ Mohammed Rabie, *Conflict Resolution and Ethnicity* (Westport, Conn.: Praeger, 1994).

² *Ibid.*

³ Bleddyn E. Bowen, *War in Space: Strategy, Spacepower, Geopolitics* (Edinburgh: Edinburgh University Press, 2020); Radosław Bielawski, "Space as a New Category of Threats to National Security". *Safety & Defence* 5, no. 2

sustainability of security in space.⁴ Finally, there are studies examining the relationship between space technologies and the defence.⁵ This study addresses a topic similar to the third group of studies. However, unlike these studies, it explores how space technology directly impacts conflicts, rather than its influence on the defence.

While preparing the study, firstly the historical background was used. This allowed for the observation of the role of technology in the transformation of the nature of conflicts. Secondly, a comparative analysis was used. Through comparative analysis, the transition between conflicts in the traditional era and the information age is highlighted. Thirdly, the study is supported by a technological impact analysis. This analytical method questions the impact of technology on conflicts. Finally, an interdisciplinary approach was adopted. A connection was established between two different disciplines, namely international relations with conflict and engineering with space technologies.

The study consists of two main sections. In the first section, the changing nature of conflicts and the role of technology in this change are examined. This examination is approached through tools, actors, and impacts. In the second section, the study focuses on the opportunities that space technologies provide in conflicts.

Changing Form of the Conflicts

Humankind has been and continues to be in a constant process of development. These developments played an important role in changing human relations, social order, tools and equipment, and similar issues. In the 21st century, space technologies have brought developments that have largely changed human life. Thanks to satellites in space, weather reports are created, location is determined, communication and transportation are facilitated, internet signals are improved, data transfer capacity is

(2019): 1-7; Eirik Billingsø Elvevold, *War in Space: Why Not? A Neorealist Analysis of International Space Politics (1957-2018)*. Master Thesis. (Lisbon: Universidade Nova de Lisboa, 2019).

⁴ Nonthapat Brave Pulsiri and Victor dos Santos Paulino, "The Green Path to Space Sustainability: Twenty Years of Research", *International Journal of Technology, Management and Sustainable Development* 22, no. 3 (2024): 299-318; Olga Stelmakh-Drescher, "Long Term Sustainability of Outer Space Activities and Space Traffic Management". *Advanced Space Law* 12, (2023): 82-86; Kaitlyn Johnson, "Space Sustainability and Debris Mitigation", *Key Governance Issues in Space Report*. Washington DC: CSIS, (2020).

⁵ Alime Özyıldırım, "Space from Perspective of National Security". *The Journal of Defence Studies* 43, no. 2 (2023): 384-397; Shamaila Amir and Nazia Abdul Rehman, "Space Technology and Its Military Application: Options for Pakistan", *Journal of Advances Military Studies* 15, no. 1 (2023) 136-152; Maksym Sokiran, et al. . "Space Information and Technologies in the Military Activity of Ukraine: Legal Aspect", *Advanced Space Law* 9 (2022): 66-80.

increased, and many other activities that affect every aspect of life are carried out. Space technologies affect politics, the economy, trade and social life, as well as the military. The defence industry is undergoing a major change by using these technologies. This change undoubtedly affects the form of conflicts.

Tools

The tools and methods used in conflicts have developed and changed within the framework of the inventions discovered by human beings. It is a paradox that as humans evolved and progressed, they became better at killing each other.⁶ However, the primitive weapons that ancient people developed to protect themselves from environmental hazards turned into a necessary tool to protect settlements against rivals and to ensure the national interests of political structures in later years. Defence is seen as a need that shows the power of a state and increases its deterrence. The power of states is analysed by looking at the strengths and weaknesses of their defence. Military power alone is not enough to be but it is one of the factors that support the state's strong stance and is the most prominent.

The oldest war tools discovered are basic stone tools dating back 3.3 million years. It is known that sticks and stones were first used in conflicts. In later periods, spears and stone axes were developed. Spears are among the oldest hand-held weapons, dating back at least 500,000 years. Clubs, stone hammers, and short stone knives were also part of the early human arsenal. Following the Stone Age, with the development of metalworking, cutting tools emerged in the Bronze Age. The first metal swords were invented around 3300 BC, in The first steel swords were developed in the Iron Age 1200 BC, which were longer, sharper and much more durable. Around 10,000 BC, humans added a new component to their weapon designs and developed the sling. Slings were great for stunning or killing small, fast games, and were not bad at taking down human opponents. The bow and arrow, which dates back 64,000 years, was an inevitable advance in war weapons, and swords, spears, bows and the like were still widely used for decades to come.⁷

The most important invention that changed the history of conflict was gunpowder. With the discovery of gunpowder in the 14th century, firearms drew a line between the ancient and modern ages.⁸ The discovery of firearms paved the way for the emergence of other equipment that

⁶ George, C. Stephen, "From Stone Tools to Guns: A Timeline of Ancient Weapons". Discover Magazine, 2023, <https://www.discovermagazine.com/technology/from-stone-tools-to-guns-a-timeline-of-ancient-weapons> (accessed October 12, 2024)

⁷ *Ibid.*

⁸ *Ibid.*

played an important role in defence, such as tanks and rifles. With the increase in knowledge, integrated systems were created for the use of firearms on land, as well as in the air, sea and underwater. The discovery of gunpowder was an important turning point in the history of conflict.

The development of space technologies, similar to gunpowder, can be seen as a turning point in 21st century conflicts. While tools such as stones, sticks, and spears used in ancient times were tools that had to be used face to face with the enemy, the emergence of guns has increased the distance to the enemy. Space technologies, on the other hand, allow the enemy to be harmed even when they are miles away. Thanks to satellites, conflicting groups can detect the location of their enemies, collect information about the terrain, and hit targets by directing unmanned aerial vehicles. All these activities are carried out via space-based systems, and it is not necessary to be stationed in the conflict zone to carry out these activities.

Space-based conflict tools provide more accurate results compared to other conflict tools. Since moves are made based on satellite data, the probability of a direct target-oriented move is increased. In addition, for a conflict managed through space technologies, the effects of elements such as difficult terrain conditions, unfavourable weather conditions, and a large number of the enemy's army are minimized. Developing technologies allow conflicts to be conducted remotely and without confronting the enemy.

Actors

With the changing time, non-state actors have also started to come to the fore in terms of influencing international issues. Civil society organizations, corporations, various institutions, and certain individuals often exert greater influence than states in specific areas. This multi-actor structure, which characterizes the increasingly complex dynamics of international relations, also becomes evident in the context of conflicts. The involvement of diverse actors in conflict scenarios reflect the shifting nature of power and influence, where non-state entities play a pivotal role alongside traditional state actors.

In the 21st century, we witness various actors in the leading roles in conflicts. The conveniences provided by technological developments provide all kinds of structures with the opportunity to create conflicts. Integration in the world has become stronger because of advanced information and communication technologies. Therefore, it has become easier for a state, a group or an individual to gather economic and military support. Hence, civil conflicts have become more common than wars between states.

Increasingly, conflicts involve not only state armies but also non-state armed groups, criminal gangs, drug traffickers and terrorists. Today,

conflicts are becoming more complex and protracted.⁹ In today's world, where people from all over the world can easily communicate with each other, it becomes easier for such groups to justify their causes and rally supporters. Non-state organizations and conflict groups are not just structures consisting of a certain ethnicity as they used to be. There are hundreds of people from different countries in the organizations and groups.¹⁰ The proliferation of information and communication technologies is one of the most important reasons for this. Another reason is that states do not want to confront each other and get involved in a hot conflict. For this reason, non-state organizations are used to prevent confrontation from states, for which they receive support from various states.

Nowadays, it is possible to express that conflicts are caused by non-state entities rather than states. There has been a shift from conflicts between minimally disciplined state armies to the conflicts between relatively uneducated local groups that characterize recent conflicts.¹¹ The fact that the conflicting groups are non-state structures leads to uncertainty about the tone of the conflict and the uncertainty of what path will be followed for a solution.

Effects

According to Andrew Knighton, what ultimately proves the value of a weapon is its effect on its opponent.¹² When we look at the weapons that have emerged from the earliest times to the present day, we see that the tools of conflict that started with stones have evolved into unmanned aerial vehicles. States continue to develop in the defence industry to ensure their survival, protect their interests and show their power. The strength of the defence industry is measured by the degree of effectiveness of the military inventory.

In today's world, military inventory, such as the number of soldiers and the number of tanks and rifles, does not have significant effect on the power of an army as it had in the past. Rather, the extent to which military inventory is integrated with space-based systems is more prominent. Satellites, GPS technology, signal jammers, anti-satellite systems, and unmanned aerial vehicles play an important role in strengthening defence.

⁹ William R. Avis, "Current Trends in Violent Conflict". K4D Helpdesk Report (March 25, 2019).

¹⁰ Cenker K. Demir,. "Terörizm ve Terörizmle Mücadele", Güvenlik Yazıları Serisi, no. 26 (2019): 1-9.

¹¹ The Women's Foreign Policy Group, *The Changing Nature of Conflict New Dimensions New Players New Perspectives*,(Washington DC: The Women's Foreign Policy Group, 2001).

¹² Andrew Knighton, "Medieval Weapons That Maimed and Killed", *History*, 2023, <https://www.history.com/news/medieval-weapons-knights-middle-ages> (accessed October 24, 2024).

As the military inventory grows stronger and develops over time, its impact and damage naturally become greater. Unlike previous conflicts, the integrated operation of the defence industry with satellite systems has greater human losses. In past hot conflicts, the area where the war took place, and the combatants were more obvious. However, today, due to satellite systems, it has become common to detect places where civilians live and organize attacks. Targeted attacks cause many civilians to lose their lives. An example of this situation can be observed in the 2022 Russia-Ukraine war. From the outset of the war, the conflict has not been confined to traditional battlefronts but has extended into urban centres and civilian areas. This expansion of the conflict zone, facilitated by satellite systems, has significantly amplified its impact, as attacks on non-military targets have become more prevalent. This example clearly demonstrates how space technology has transformed the nature of modern warfare, leading to broader and more indiscriminate consequences, particularly in terms of civilian loss of life.

Secondly, the impact of the damage caused by contemporary conflicts is significantly greater. The enhanced precision of attacks facilitated by satellite systems and the increased effectiveness of technological defence mechanisms, result in more extensive environmental degradation. Unlike past conflicts where destruction was often confined to specific battle zones, modern warfare, guided by satellite systems, can lead to widespread ecological harm. For example, missile strikes, guided by satellite-based targeting and GPS technology, can cause immediate structural damage and long-term environmental consequences, such as soil contamination, water pollution, and ecosystem disruption. While all forms of conflict lead to destruction, the technological advancements in weaponry and satellite-enabled intelligence are significantly intensifying the scale and long-term ecological damage associated with modern warfare.

Thirdly, the conflicts that have occurred in the 21st century are innumerable because of uncertain and scattered nature of the conflict area, the diversity of conflicting groups, and the management of the conflict through space-based systems. Space-based systems enhance the communication and information-gathering capabilities of conflicting groups, enabling them to organize more effectively. Furthermore, these technologies may assist non-state actors in expanding their influence on local and global levels. Hence, ending the conflict is becoming more difficult. The diversity of the conflicts and the conditions for the parties to sit at the table and negotiate are becoming increasingly difficult. The Syrian conflict, which began in 2011, is a prime illustration of how 21st century conflicts have become increasingly intense. The war involves a wide array of conflicting groups, including the Syrian government, various opposition factions, and extremist organizations such as ISIS. The use of space-based technologies, including satellite surveillance and

communication systems, has enabled all sides to more effectively target each other, complicating the dynamics of the conflict. The uncertain and scattered nature of the conflict areas, with shifting front lines and the involvement of multiple international actors, has made it difficult to establish control and reach a peaceful resolution.

Lastly, the psychology of fear has been significantly amplified through the media, a prominent feature of the information and communication technology age. In previous centuries, due to limited communication tools, people had access only to general or delayed information regarding conflicts. However, in the present day, the widespread availability of the internet and various media platforms has made it possible to access real-time information, including images of the conflict, its scale, its immediate effects, and developments as they unfold. This constant flow of information contributes to heightened anxiety and insecurity among the public.

Moreover, conflict groups can now utilize the internet to recruit and mobilize individuals, spreading their messages and gathering support through social media platforms such as Facebook, Twitter, and Telegram, as well as traditional mass communication tools like television and radio. This access to rapid communication channels amplifies the reach of conflict groups and makes individuals continuously vulnerable to threats, as they are constantly exposed to potentially distressing information. The strategic use of fear through these platforms serves to manipulate public perception, provoke emotional reactions, and maintain a sense of urgency or vulnerability, which can influence public sentiment and participation in conflicts. Thus, the role of fear in modern conflicts is not only psychological but also a tool of influence and mobilization, exacerbating the complexity and uncontrollability of contemporary warfare.

Prospects of Space Technologies on the Conflicts

Space-based technologies are dual-use technologies that can be used in both peace time and conflict times. The dual-use technologies are generating fundamental transformations both in the way wealth and power is created, and wars are fought because technology diffusion is now virtually instantaneous and unstoppable.¹³ While it has effects such as ensuring the flow of information between politicians, making many activities in daily life more functional, and facilitating the economy and trade; at the same time, it plays a role in strengthening the hands of the parties in times of conflict. It is important to note that space technologies offer very different and distant usage opportunities. This section analyses opportunities that space-based technologies enable in conflict times.

¹³ Mohan Malik, "Technopolitics: How Technology Shapes Relations Among Nations", *The Interface of Science, Technology & Security* 12 (2012): 21-29.

The First Gulf War was the first time that space-based technologies were recognized as an effective tool in conflict. The First Gulf War occurred in 1990 and is known as the first space war. Satellite images and telecommunications, which were part of Operation Desert Storm, made it possible for the first time to see how space technologies strengthened a state during war.¹⁴ The first clear demonstration of the tangible benefits of space policies came during the Gulf War of 1990–1991, when the United States gained a strategic advantage—and ultimately emerged victorious—by utilizing reconnaissance and intelligence satellites.¹⁵ The war in Afghanistan in 2001 was another indicator that satellites were indispensable.¹⁶ Since the 1990s, space technologies have been a pillar of hot conflicts.

After the First Gulf War, the states witnessed how important space-based technologies are effective in changing the direction of the conflict. This changing course of the war had a great impact on the world. Since then, the conventional perspective on the conflict has changed. Nowadays, it is more common to see conflicts and wars using space technologies. This can be seen in the war between Ukraine and Russia. Ukraine has gained the power to defend itself against Russian attacks due to satellite technologies.¹⁷ Similarly, satellite technologies are used in the Israel and Palestine wars. Satellite technologies play a critical role in the states' ability to protect themselves from enemies.

In both the Russia-Ukraine war and the Israel-Palestine war, weaker groups, such as Ukraine and Palestine, have leveraged space-based technologies to gain strategic advantages despite their limited resources. In the case of Ukraine, the integration of satellite systems has played a significant role in enhancing communication and military coordination. For instance, the use of Starlink satellites provided by SpaceX enabled secure, real-time communication, helping Ukrainian forces maintain operational effectiveness.¹⁸ Additionally, Ukraine has utilized satellite

¹⁴ W. Sharon Lang, "SMDC History: 25 Years Since First Space War", U.S. Army, 2016, https://www.army.mil/article/161173/smdc_history_25_years_since_first_space_war (accessed November 8, 2024).

¹⁵ George Friedman and Meredith Friedman, *Savaşın Geleceği 21. Yüzyılda Güç, Teknoloji ve Amerikan Dünya Egemenliği*, Translated by Enver Günsel, (İstanbul: Pegasus Yayıncılık, 2015).

¹⁶ Livio Piloni, "Space: The New Frontier of Security Policy", *CSS Analyses in Security Policy* 171 (2015): 1-4.

¹⁷ Markus Holmgren, "The Role of Space Technologies in Power Politics Mitigating Strategic Dependencies Through Space Resilience", *FIIA Briefing Paper*, (June, 2023).

¹⁸ *The Economist*, "How Elon Musk's Satellites Have Saved Ukraine and Changed Warfare", 2023, https://www.economist.com/briefing/2023/01/05/how-elon-musks-satellites-have-saved-ukraine-and-changed-warfare?utm_medium=cpc.adword.pd&utm_source=google&ppccampaignID=

imagery and surveillance technologies to track Russian movements, identify key military targets, and make more informed strategic decisions.

Although Palestine has limited access to advanced space technologies, it still has managed to use available resources to enhance its communication and intelligence capabilities. Palestinian groups have relied on satellite communication to maintain contact with the outside world and coordinate efforts, especially during times when traditional infrastructure is damaged or unavailable. Moreover, while Palestine lacks the advanced satellite systems, it has utilized available satellite imagery and unmanned aerial vehicles to monitor Israeli military movements, identify potential targets, and gather intelligence in real-time. This access to satellite and communication technologies has allowed these weaker groups to maintain some degree of operational coordination and influence the conflict's dynamics, despite the power imbalance.

Space-based technologies play effective role in strengthening the defence. Space technologies are also increasingly important in conflict.¹⁹ Associate Professor Dr Bleddyn E. Bowen, who studies space policies, expresses the importance of space in terms of the defence sector with the following words: "Space is a strategically vital geography for any modern military-economic power. Force enhancement, network-centric warfare, precision-guided munitions, accurate navigation and treaty verification would be impossible without the help of satellite systems."²⁰ In case of any war or conflict, space technologies are needed to determine coordinates and provide data to the army. Satellite images are important for the decision-making process and situational awareness. Space systems represent an important power for the defence sector. Space technologies are seen as an advantage that strengthens the military operations.²¹ Space power both guarantees and makes possible modern military power on Earth.²²

Secondly, space-based technologies offer significant advantages and conveniences in obtaining intelligence. States first obtained

18151738051&ppcadID=&utm_campaign=a.22brand_pmax&utm_content=conversion.direct-response.anonymous&gad_source=1&gclid=EAIaIQobChMIxsGV4MnhjAMVxIVoCR1MBDi4EAAYASAAEgLVGfD_BwE&gclid=aw.ds (accessed April 17, 2025).

¹⁹ *Ibid.*

²⁰ Bleddyn E. Bowen, "Cascading Crises: Orbital Debris and the Widening of Space Security", *The International Journal of Space Politics & Policy* 12, no. 1 (2014): 46-68.

²¹ Fahri Erenel and Doğan Erenel, "Yeni Harekât Alanı Olarak Uzay ve Uzay Komutanlığı". In 21. Yüzyılda Uzay Gücü ve Hava Hakimiyeti (pp. 51-74), edited by Ferdi Güçyetmez, (İstanbul: İdeal Kültür Yayınları, 2023).

²² Cem M. Oğultürk, "Uzayda Kollektif Savunma ve NATO'nun Yaklaşımı". In 21. Yüzyılda Uzay Gücü ve Hava Hakimiyeti (pp. 75-94), edited by Ferdi Güçyetmez, (İstanbul: İdeal Kültür Yayınları, 2023).

intelligence by placing spies in foreign countries' government institutions and then by listening to telegraphs, radios and phones.²³ In the 21st century power struggle, information and communication technologies are an important source of power in terms of states obtaining intelligence, determining enemy coordination, aircraft producing accurate results, and developing early warning systems against threats. Information and communication technologies provide information exchange much faster than in the past. Thus, it becomes easier to obtain intelligence and for actors to shape their strategies according to these information and data.

The use of satellites in espionage activities dates back to the 20th century. The first spy satellites were introduced in the 1960s. These satellites have an important function in terms of observation, tracking and monitoring.²⁴ States collect intelligence, make observations, and most importantly, communicate through satellites.²⁵ Traditional intelligence methods have become outdated. Intelligence information obtained through modern technologies is easier to collect and more accurate. Although espionage activities are considered a prominent issue in conflict terms, such activities are ongoing regardless of peacetime and conflict time. In peacetime, states use and target space technologies for strategic advantage, and during conflict, states use space technologies for hybrid operations such as cyber sabotage and espionage.²⁶

Third, it is important to mention the necessity of space technologies to ensure security in outer space and conflicts on Earth. Space technologies are an effective tool and a unique component in conflicts on Earth. However, outer space should not be forgotten. Space is a geographical area like land, sea and air and its security is in question. It is not possible to talk about a concrete conflict between actors in space yet. Nonetheless, the development of Anti-Satellite Weapon (ASAT) and the testing of these weapons did not come out of nowhere. The USA has been conducting ASAT tests since the 1950s, Russia since the 1960s, and China since the 2000s. In 2007, China shot down one of its weather satellites, opening the door to the rebirth of ASAT weapons.²⁷ Following this move by China, the US destroyed a decommissioned satellite containing toxic gases with an ASAT test to remove it from orbit in 2008.²⁸ There has been no conflict in outer space so far, but such moves by states

²³ Friedman and Friedman, *op. cit.*

²⁴ Erenel and Erenel, *op. cit.*

²⁵ Éléonore Daxhelet, "The Intersection between Outer-Space Security and Cybersecurity". FINABEL – The European Army Interoperability Centre, 2023, <https://finabel.org/the-intersection-between-outer-space-security-and-cybersecurity/> (accessed November 15, 2024).

²⁶ Holmgren, *op. cit.*

²⁷ Pigoni, *op. cit.*

²⁸ Cassandra Steer, *Why Outer Space Matters for National and International Security*, (Filadelfia: University of Pennsylvania Carey Law School, 2020).

forces them to take precautions against every possibility. Actors must be more careful in order to ensure the security of satellites in outer space because any damage, harm or destruction of satellites has the potential to cause problems for activities on Earth.

Fourth, actors possessing space-based technologies create deterrence. Space power is an instrument that states want to have to create deterrence. Space technologies have dual-use as part of a peaceful environment and as part of a conflict. Space power, which creates deterrence, is desired by many states.²⁹ At this point, it is possible to compare space power to economic power. Space power is a source of motivation for a more stable progress in relations during peacetime and a trump card in the hands of states in conflict times, in order to prevent conflict from starting, to stop it if it has started, or to strengthen defence during conflict. Space vehicles are important in terms of creating deterrence. The art of deterrence also begins with four questions: Who do you want to deter? What actions do you want to deter? What tools do you have? How will you use these tools?³⁰ The first two of these questions are issues that vary from actor to actor. However, the subject of tools draws attention in terms of space deterrence. Through satellites, actors strengthen land, air, sea navies and cyberspace activities on Earth and close their gaps. In addition, in outer space, the destruction of satellites via ASAT and damage to other satellites are among the situations that will put actors in a difficult position. It can be stated that space technologies have a deterrent effect both on Earth and in space.

Lastly, space-based technologies make the security of critical infrastructures vulnerable. As is known in the 21st century, all systems are gaining functionality with space-based technologies. Every day on Earth, systems in space make the ordinary possible. The satellite constellation that makes up the global positioning system enables precise navigation. Farmers use space systems to manage crops. The global financial system relies on space systems for precise timing of transactions.³¹ It is quite easy to multiply such examples. This situation makes critical infrastructures more fragile and sensitive. Especially in times of calamities, the first thing that comes to mind is to organize attacks on critical infrastructures. In this way, the other party is put in a difficult position and the natural flow is interrupted. Russia carried out cyber-attacks on important websites in

²⁹ Deganit Paikowsky, "Uzay Politikalarında Devam Eden Trendler". In *Uzay Güvenliği* (pp. 179-190), edited by Sait Yılmaz, (İstanbul: Milenyum Yayınları, 2013).

³⁰ Alex Schiller, "Space's Role in Deterring Conflict". Pacific Forum, 2023, <https://pacforum.org/publications/yl-blog-54-spaces-role-in-deterring-conflict/> (accessed November 15, 2024).

³¹ Christian Vasquez, "Space is essential for infrastructure. Why isn't it considered critical?", *Cyberscoop* 2024, <https://cyberscoop.com/space-critical-infrastructure/> (accessed November 13, 2024).

Estonia in 2007 and in Georgia in 2008, causing the operations of many sectors in the country to be disrupted.³² Hence, it can be assumed that space-based applications are highly integrated and critical infrastructures are always under threat due to this integration.

There is a debate about whether space assets should also be considered critical infrastructure due to the integration of space systems and critical infrastructures, and the fact that an attack on space systems would endanger critical infrastructures. The increasing importance of space systems for daily economic activities and the rapidly expanding space economy have led many experts to argue that they should be designated as critical infrastructure to better protect these systems. Designating space assets as critical infrastructure would also draw a line that hostile actors should not cross at a time when cyberattacks on space systems and GPS jamming are becoming increasingly common.³³ Ensuring the security of space assets and increasing security measures would naturally be a parallel move to the security of other critical infrastructures. When the effects of space technologies on today's conflicts are observed, it is clearly seen that it is now difficult to gain supremacy in conflicts without using these technologies. Actors should transform by observing the cyclical changes. No matter how well equipped they are in conventional elements, a navy that is not integrated with space-based technologies will be inadequate. While some actors are aware of this, others are not, and some lack the economic resources, technological capabilities and skilled personnel needed to integrate with these technologies. However, at the end of the day, actors who keep up with the times will come to the fore in the power struggle.

Conclusion

Since humans have always been curious and observant, they have not been satisfied with what they have and have been in a constant state of research. Humans keep on discovering new things, and these discoveries have paved the way for the change, development and transformation of life. In the 21st century, discoveries in information and communication technologies have integrated human life with technology more than before. Humankind's relationship to space is currently being rewritten with remarkable speed.³⁴ It is possible to say that nowadays space technologies are more effective and efficient.

During the Cold War, the gateway to space was partially opened as the rivalry between the USA and the USSR extended beyond earth and into outer space. When comparing the Cold War and the post-Cold War

³² Nezir Akyeşilmen, *Disiplinlerarası Bir Yaklaşımla Siber Politika & Güvenlik*, (Ankara: Orion Kitabevi, 2018).

³³ Vasquez, *op. cit.*

³⁴ Holmgren, *op. cit.*

periods, it can be seen that the new security paradigms have altered concurrently with the content of the idea of space security.³⁵ During the Cold War, sending vehicles into space and carrying out manned missions were indicators of success, but today such activities have been surpassed. Hundreds of satellites are sent into space every year, the Moon and other planets are explored with rovers, and various samples are brought from space to Earth. In addition, topics such as space tourism, space mining, space trade, and life in space are frequently discussed.

Space-based technologies are important in peacetime and conflict times. When the importance of space technologies is questioned, it is seen that it is impossible to strengthen one's hand in conflicts without these technologies. There are many statements supporting this claim from the authorities in the three great space powers, the USA, China and Russia. The Chinese military PLA has stated that its "focus areas" include modern command and control communications systems, cyber, space and long-range ballistic and cruise missiles for deep strikes, stealth platforms, and improved air defence.³⁶ According to Russians, the character of wars for the next 30 years will be shaped by weapons activated by satellite targeting and navigation.³⁷ Furthermore, US Colonel Harry Sachakian made a statement saying, "Who rules space rules the world."³⁸

Major powers are increasingly investing in developing ground-to-space capabilities. The United States, China, India, and Russia have demonstrated their ability to use anti-satellite missiles. During conflict, states also use space technologies for hybrid operations such as cyber sabotage and espionage.³⁹ Since the 1990s, the entire world has witnessed the impact of space technologies in directing conflicts. In an international system where power struggles have existed and will continue to exist, actors must develop space technologies, follow innovations in this field, and train people to protect their national interests.

³⁵ Hasret Çomak and Burak Ş. Şeker, *Space Environment and International Politics*, (London: Transnational Press London, 2024).

³⁶ Malik, *op. cit.*

³⁷ Erenel and Erenel, *op. cit.*

³⁸ Oğultürk, *op. cit.*

³⁹ Holmgren, *op. cit.*

