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Outer space as an operational domain: an analysis of the challenges and challenges for the Spanish Armed Forces

Abstract

Outer space has become a new physical space where human beings perform multiple activities, both public and private, and in some cases, they are strategic services, essential for the functioning of our societies and a matter of concern for national security, since without them our way of life might change dramatically. Additionally, there could be some other activities and services with extraordinary perspectives to economic growth, if the possibility of exploiting the profitable natural resources from celestial bodies materialised. For this reason, a new space race has already begun with the aim of leading this new stage of commercial expansion towards the Moon. Therefore, in just a few years, outer space has become increasingly relevant in the field of defence, as it is already considered a new operational domain on which current military operations depend extensively, possibly being in the near future carried out independently. Thus, in the face of these new challenges for humanity and our nation, the Spanish Armed Forces should be committed to adapt to such vertiginous changes and evolve towards a new paradigm of warfare that is being defined nowadays. As we witnessed previously in the history of nations, this will require the modernisation of current military capabilities and the development of new weapons systems, as well as far-reaching doctrinal and organisational changes to adequately equip the Air and Space Force. If we do not evolve accordingly with our time, we are at risk of

jeopardising our national security and even worse, the future of our very society and the principles and values it represents.

Keywords

Security and defence, Outer space, Spatial geopolitics, Militarization, Operational domain, Space domain.

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Outer space is considered the final frontier of geopolitical confrontation (National Security Council (NSC), 2021).

1. Introduction

The change of name of the Air and Space Army (EA after its abbreviation in Spanish) of the Kingdom of Spain is not simply changing names similar to other allied nations but is a declaration of intent that reveals the determination to begin a new phase in the history of the Spanish Armed Forces (after its abbreviation in Spanish) (*Ministerio de Defensa*, 2022b).

It embodies a new phase for the Spanish Armed Forces that will allow them to adapt to the new geopolitical situation and confront the new risks and threats in space, which have been defined by the North Atlantic Treaty Organisation (NATO) (2022b), and which will require it to be at the technological forefront in order to develop new capabilities and conduct military operations within a new operational domain: outer space.

Over the last three years, this change has been reflected in an important organisational adaptation for the Armed Forces: both in the institutional sphere of the EA and in the operational sphere of the Office of the Chiefs of Staff (EMAD after its abbreviation in Spanish). It has led to the creation of new units, such as the Space Command (MESPA after its abbreviation in Spanish) and the Space Surveillance Operations Centre (COVE after its abbreviation in Spanish), and command and control structures, such as the Operational Space Command (MOESPA after its abbreviation in Spanish) and the Space Component Command (MCESPA after its abbreviation in Spanish).

These organisational changes in defence are taking place at a time when human activity in outer space has become vitally important for the development of modern societies, to such an extent that one may argue that there is now a large-scale dependence on space services (Azcárraga Arana, 2013).

Over the last two decades, human activity in space has increased exponentially. A resurgence of global interest in space, spurred by millions of dollars in investment and technological advances brought about by the Fourth Industrial Revolution, has sparked a new space race between major powers to gain ground in space. In the specific case of the superpowers, the US and China, the goal is to colonise the moon and, perhaps in the future, Mars as well.

This period is characterised by new state actors joining the exploration and exploitation of space, with more than 100 countries now deploying some form of space assets, but also by non-state actors, who have become increasingly important and a major element of space missions.

Compared to the first space race, this new space race is witnessing a commercial drive by the private sector, thanks to the business opportunities offered by space for the future of mankind (Aznar & Sánchez-Mayorga, 2021).

Alongside traditional government agencies, civilian bodies and private companies have shaped an environment conducive to the commercial exploitation of space, which has become the engine of progress and prosperity in our states. But, at the same time, it has induced a dependence on the space segment that affects a large part of the world economy and, consequently, is a matter of national security for leading states, reaching geopolitical dimensions for the major powers (*Ministerio de Defensa*, 2022a).

In the words of Colonel Martínez Cortés (2020b): "Modern societies depend on satellite services in transportation, business and commerce, financial services, internet-based services, broadcasting, weather forecasting, disaster management, agriculture, environmental protection, science and military activities". Because of this dependence, our way of life would change radically if we could not avail these strategic infrastructures for society.

This dependence also affects to a large extent the highly technical Armed Forces (*FF. AA.* after its abbreviation in Spanish), so that, in just a few decades, these space assets have gone from being a support element of ground military operations to becoming an indispensable element of the planning, control and execution of military operations. This weakness of the *FF. AA.* poses a vulnerability for national security, forcing states to protect the space segment and even to defend these means with the use of force, if necessary.

In the words of the Chief of Staff of the Air and Space Army, Air General Javier Salto Martínez-Avial:

> "We have to assume that Space is no longer a sanctuary. Recent geopolitical developments only confirm that it has become an environment of high strategic interest, increasingly competitive and contested, and that some of our neighbours such as France, or the United States, do not hesitate to call space the new battlefield. Therefore, in order to minimise its vulnerability to irresponsible or malicious use and to boost its security, it is a priority to guarantee free access to and exploitation of space, protecting aerospace infrastructures, resources and services of national interest against any challenge or threat whatsoever» (Salto Martínez-Avial, 2022c: 20-21).

NATO›s new Strategic Concept, agreed by the Heads of State and Government at the Madrid Summit in 2022, states the need to combat authoritarian regimes that undermine the democratic principles and values of member states (Organización del Tratado del Atlántico Norte (OTAN), 2022a: 3).

The publication of the Spanish Ministry of Defence, Operating Environment 2035, analyses possible scenarios or operational contexts of action by the Armed Forces and the changes they will have to face in order to adapt to the environment; it determines

the strategic nature of these resources and the importance of these services provided by space systems for national security (*Ministerio de Defensa,* 2019).

In their task of defending society, our Armed Forces are obliged to adjust to the new situation currently underway in space, so they may protect space assets and thereby, our daily lives. Given the complexity of the enterprise, it is necessary to understand the different aspects involved in the domain of space, from the civil to the military, from the political to the legal, and how they are interconnected.

This article analyses the relevance of the private sector in the development and operation of space assets, in order to understand the significance of the space sector in our nation›s economy and its strategic importance for public security.

This is followed by a discussion on international space governance and the need for a legal framework regulating the exploration and exploitation of the stars in accordance with international law, which is necessary to avoid conflicts between states.

Next, it examines the geopolitical environment and the importance of space for international security and defence, in a global scenario characterised by instability and confrontation. Subsequently, it presents the most relevant aspects characterising the progressive militarisation of space.

The article concludes with an analysis of the different space capabilities available to the FF. AA and the challenges faced by the EA in fulfilling its responsibilities as the guarantor of national security within this operational domain.

2. Security and Defence in Outer Space

The 20th century space race was a competition between the two superpowers that emerged after World War II, the USA and the USSR, who strove to develop space capabilities that were superior to those achieved by their direct competitor.

Such was this rivalry that, on every space mission, the space race became a show of strength in the competition for strategic control of space and technological superiority. It was not for nothing that these space achievements became a multiplier of the international reputation and external influence of these two rival powers (Pérez-Grande, 2021).

During this period, important advances were made, such as the launch of the first artificial satellites and space probes, manned space flights in orbit around the Earth, and even multiple moon landings, which have gone down in the annals of human history (Nucera, 2019). The technological developments of this era have enabled the subsequent development of other space systems that are highly important for the economy of today›s societies, such as satellite communications, terrestrial imagery for weather forecasting or global positioning.

What is unknown about this birth of the space age is that the technology that made it possible to launch objects into space came from another military technology, which had been developed to build large rockets capable of launching intercontinental missiles (ICBMs), or the technology used to develop the first military satellites for observation and spying on adversaries.

From its beginnings, the space race has been linked to both security and defence and to scientific research for non-military purposes, fostering close links between state space agencies and the military in order to launch different space systems into orbit, as well as the dual use of many of these systems.

This symbiosis allowed space systems for military use to become an essential defensive element, to the extent that the 1991 Iraq war was the first to be dubbed a space war:

> "The first demonstration of the use of outer space for military purposes. Although the conflict didn›t occur in outer space, it has been referred to as *the first space war*. The reason for this designation is that the US and coalition forces relied heavily on GPS satellites and other types of satellite capabilities to manage and control the military conflict and navigate civilian activities" (Dawson, 2018: 16).

Since then, the space domain has become an extremely important means of national defence and therefore a matter of national security. Proof of this is that certain military capabilities which are crucial to the defence of these superpowers, rely on space-based means, such as the aforesaid launch of intercontinental missiles and missile defence on which nuclear deterrence itself dependent (Aznar & Sánchez-Mayorga, 2021).

2.1. The private sector as a driver of change in space: a paradigm shift in the space domain

In the early days of the space race, space activities were conducted exclusively by public agencies of the nations that had the necessary technology; and, until the 1980s, private sector participation was almost entirely subject to the state's monopoly.

This began to change during the 1990s, when some private companies made inroads into the space market through the satellite telecommunications sector. But it was not until well into the 21st century that the revolution in private-sector space activities took place, to such an extent that it has been called the democratisation of space (Ventura-Traveset, 2021).

Over the last decades, the space sector has witnessed the creation of multiple companies with a clear business purpose; to the extent that today 82 % of the space economy is in the hands of private enterprise, and it is estimated that by 2030, the space economy will have grown by 74 % (Euroconsult, 2022).

This demonstrates how the progressive increase in business volume within the space sector and its immense future prospects have stimulated the growth of space activity, which in turn has benefited from the development of miniaturisation technologies applied to building small satellites. These multitasking high-performance satellites can be launched and operated at affordable prices by private companies, compared to the multi-billion-dollar figures at the beginning of the space race.

These technological advances are bringing about a new revolution in the space telecommunications sector with the launch of mega constellations of satellites into orbit; to provide high-speed internet services to the entire planet, among other purposes. This will make it possible to meet the huge demand for connectivity required by societies today for their global development (Ventura-Traveset, 2021).

The private sector has also identified a significant business opportunity in other fields such as Earth observation, space tourism, space debris removal and even space mining. This is a new context for the space sector which has revolutionised the old concept of space activity, to the extent that there has been a democratising effect, known as *New Space*, which represents a paradigm shift from the Cold War context (Ventura-Traveset, 2021).

It is not a by-product of the current unstable geopolitical situation and the formation of different spatial alliances. It is not even a product of renewed interest in exploiting the resources of other extra-terrestrial bodies such as the moon. The new paradigm has been triggered mainly by the emergence of private enterprise in the space market. This has been demonstrated over the last decade, when the private sector went from playing a testimonial role to each year placing more satellites in orbit than state space agencies. In some cases, they have become key actors in the space activity of states.

This unprecedented entrepreneurial achievement was enabled by government support as in the United States, which has permitted most of these civil space activities to be carried out by US-based companies. Moreover, private companies with relevant levels of space activity are also beginning to emerge in other countries such as Japan or China (Ventura-Traveset, 2021).

This phenomenon has drawn the attention of the European Space Agency (ESA), which has realised that there is a great opportunity to exploit space assets along the lines of the US model, as it possesses the experience, technology and competitive industrial capabilities to do so. This has already been set out in the ESA Agenda 2025 (Aschbacher, 2021).

Currently, Europe is at a lower level than the US. In order to achieve these objectives, an ambitious European space strategy that takes advantage of this potential is needed, which in turn must be translated into concrete investments in the space sector. It is also necessary to make changes to European policies, like those of the United States, as has already been done by Japan and China, as well as a review of the legislative framework applicable to the use and exploitation of space resources (Aschbacher, 2021).

2.2. Space governance and the shortcomings of international legislation

Global governance is constituted by the legal enforcement framework and its implementing international organisations; united in a collective effort to identify, comprehend or address global problems that are beyond the capacity of individual states. It consists of different international regimes that are defined as a set of principles, norms, rules and decision-making procedures intended to provide some overall order in the specific field of international relations (Jakhu & Pelton, 2017).

Due to its complex nature, international law has overlapping rules that may regulate the same issue in an uneven manner, resulting in a highly complex and unmanageable system which, in the specific case of space, is even more complex.

Most states are aware of the importance of ensuring security in the space domain and agree on the need for effective guidelines, rules and regulations, as well as clearly defining the limits of responsible behaviour (Jakhu & Pelton, 2017). However, in practice, there are notable differences between the rhetoric and the reality of actions by certain states, which reveal a lack of unanimous support for existing international law and hinders its effective implementation by states (Álvarez Calderón *et al.*, 2019).

There are multiple mechanisms for space governance. Of these, the most significant are five treaties which are administered by the United Nations (UN) through the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) (Santa-Bárbara Vozmediano, 2021).

These treaties are the 1967 Outer Space Treaty (OST), the 1968 Rescue Agreement, the 1972 Liability Convention, the 1976 Registration Convention and the 1984 Moon Agreement (United Nations Office for Outer Space Affairs (UNOOSA), 2008).

There are other international enforcement mechanisms for space affairs, such as the 1963 Treaty Banning Nuclear Weapon Tests in Outer Space and Under Water; the 1978 Convention on the Prohibition of Military or Any Other Hostile Effects of Environmental Modification Techniques, and the 1994 Constitution and Convention of the International Telecommunication Union (ITU).

Mention should also be made of the UN Charter itself, which will prevail over commitments made in other space-related treaties, and two key provisions of the Charter that are directly applicable to this space domain: Article 2.4, which prohibits the threat or use of force, including in outer space. And Article 51, on the right to self-defence or collective defence.

However, unlike other security sectors, such as nuclear weapons, space governance still lacks an effective multilateral management system for an adequate level of security in space; to guarantee order and stability; and to ensure long-term sustainability (Fabara Espín & Viteri Moreira, 2023).

Although there are numerous treaties and conventions in international space law today, there are important shortcomings such as the low number of signatory countries

to these treaties. This is either because the number is insufficient, fluctuating between 110 signatory states of the OST and eighteen of the Moon Agreement or because the signatory states are not the most representative ones in this field. For example, the eighteen signatories to the Moon Agreement do not include any of the major space powers (Fabara Espín & Viteri Moreira, 2023).

At the same time, these treaties often contain some kind of ambiguity or vagueness that poses an obstacle to correctly interpreting them in terms of disputed issues. There is still a lack of consensus on whether outer space should be considered a Province of Mankind or a common heritage of mankind. A distinguishing aspect that determines how each State interprets its right to explore and exploit extraterrestrial bodies (Baqués Quesada, 2023).

In this regard, it is worth mentioning that Spanish national legislation interprets outer space as common heritage of mankind and this is explicitly stated in its National Aerospace Security Strategy (González Ferreiro, 2021).

In order to understand the complexity of space governance and the resulting complications in applying its security instruments, two aspects should be considered: firstly, the inherent complexity that characterises the new challenges of international space law and, secondly, the progressive increase in the number of COPUOS member states, which makes it difficult to take decisions by consensus (Álvarez Calderón *et al.*, 2019).

In the past, legal instruments governed spatial activities adequately. However, there is now a general consensus that space activities have reached a new dimension and that these legal instruments have become too ambiguous to be effective.

The treaties of international law do not fit current needs because they were adopted at a time when the challenges and threats facing the space environment were significantly different from those of today (Jakhu & Pelton, 2017). A gulf that continues to widen, with space activities expected to multiply exponentially over the next few years compared to the last two decades (Euroconsult, 2022).

Given this new reality of space, which has brought about the paradigm shift established during the Cold War, it is essential to review existing treaties in order to bring space governance in line with the very nature of space. A nature characterised by fragmented international legislation and the complexity of applying it, as well as by a constant evolution that seeks to regulate a technology in continuous development (Álvarez Calderón *et al.*, 2019).

In recent years, the US government has maintained strong support for the private exploitation of celestial bodies such as the moon, which runs counter to international treaties such as the OST and the Moon Treaty. It has also prompted signatory states to the Artemis Accords to publicly announce their support for unblocking current international legislation and promoting civilian use of the moon. A new treaty that aims to establish new principles of cooperation governing future space activities and

to provide an interpretation of certain provisions of the Space Treaty (OST) that are not unanimous in the international community.

Despite having been developed outside the COPUOS —only supported by those nations aligned with the USA—, the Artemis Accords are intended to establish a common vision for improving space governance over the exploration and civilian use of the Moon, Mars and other astronomical objects, as well as to enhance operational safety, reduce uncertainty and promote a sustainable use of space for the benefit of all humanity (National Aeronautics and Space Administration (NASA), 2020).

For a significant part of the international community, this agreement is the first step towards shifting space from a common heritage of mankind, as many have understood it until now, to becoming a province of mankind. A slight semantic change that heralds an enormous conceptual change, as it reasserts the firm commitment of a large part of the international community to reduce the restrictions on the exploitation of space, but which represents a break with previous multilateralism and reveals the waning power of international organisations such as the UN, as it has not led this agreement as it should have done (Baqués Quesada, 2023).

In terms of the above, it may be stated that there have been some important developments in international legislation in order to define space governance. They respond to the need to update and revise the *Corpus Iuris Spatialis* in order to adapt it to the changes that have occurred in space over the last two decades.

Although this new treaty does not have the necessary international consensus, it does not seem possible to reach a majority agreement, given that the climate of collaboration that led to the signing of the first treaties at the height of the Cold War no longer exists. In fact, the future looks bleak in this regard, with geopolitical competition making its presence felt in the international legal arena as a means of exerting pressure on adversaries.

A global threat is looming that could wipe out years of multilateralism, cooperation and consensus in the UN, affecting the governance of space and undermining its necessary safeguarding (Jakhu & Pelton, 2017). In the words of Baqués (2023: 207): "A US withdrawal from the OST would lead to the immediate collapse of the legal regime deployed. We are talking about international relations: the superpowers would go ahead with their agendas and what would have to be reconsidered is not so much their degree of adaptation to existing law [...] but the very content of the law itself".

2.3. The geopolitics of space

As mentioned above, the new space race has benefited from continuous technological advances, but also from the lack of consensus among the major powers and the deliberate fragility of the international space regime which favours states with greater technological and military development, which have not been able to revise

the international treaties in force and define a new legal framework to regulate nations' activities in space (Álvarez Calderón *et al.*, 2019).

As a result, a period characterised by stability and widespread prosperity, in which international cooperation and understanding prevailed, may be considered to be at an end. Once again, the geopolitical precepts of realism prevail, and cooperation and unity are ended, when the hegemonic power of a superpower is weakened and unilateralism disappears. We are at the start of a new phase characterised by rivalry and geopolitical confrontation between revisionist states striving to regain their lost status. In the words of Santa-Bárbara Vozmediano (2021: 4):

> "The current trend is towards realism, competition and militarisation, as terrestrial rivalries are replicated in relations in space, and as international regulation becomes more obsolete by the day. The logical spiral of confrontation between the US and China, as the two main actors in this new context, is especially worrying, since other space powers are at risk of being dragged in".

This geopolitical confrontation has surfaced in conflicts such as Russia›s invasion of Ukraine in early 2022, the worsening of the Taiwan Strait Crisis or the conflict in Palestine between Israel and Iran in support of Hamas.

These armed conflicts, which have global repercussions, undermine any hope that the balance of power will be maintained and that the multilateralism that prevailed in the early decades of the 21st century and fostered a climate of trust for international cooperation and understanding, will not disappear. A balance of power that sought to build a global governance based on the precepts of liberalism, with capitalism and democracy as the ultimate exponents of a global world.

The step taken by Russia in 2022 to start a war in Ukraine or those taken by China in the South China Sea, through a progressive territorial expansion in conflict with other neighbouring states; as well as Iran with its support for terrorist groups such as Hezbollah or Hamas, with the aim of destabilising the Middle East in its favour; are perceived as a return to a world in conflict and the beginning of a new Cold War between the two superpowers: the US and China. According to some authors, this represents "the march towards a new bipolarity that turns the present into an era of transition and geopolitical rebalancing" (Aznar & Sánchez-Mayorga, 2021: 164).

This bipolarity would be led by the US on one hand and China on the other, replacing the former Soviet Union (USSR) as the geopolitical adversary of the US. Both are the leaders of two blocs around which other international states are grouped, most of which are led by the same actors as in the Cold War, confirming the return to a bipolar balance of power.

This revisionism, which favours a change in the balance of power between the great powers and produces a corresponding geopolitical rebalancing, also has direct repercussions for space. Indeed, this new Cold War, similar to the first, has the opportunity to view the conflict spill over into the domain of space.

The notable difference is that this time, in contrast to the Cold War, the international security implications of a conflict in space would be more significant due to the strategic value of the services provided by the space sector. The destructive potential for the global economy could involve the disabling of space infrastructures and the consequent technological blackout of the entire planet with direct consequences for the global economy. So, once again, the geopolitical importance of space and the complex international relations between the many spacefaring states is beginning to be discussed (Aznar & Sánchez-Mayorga, 2021)

At this point, characterised by a situation of generalised instability that could lead to armed conflict on a global scale, states perceive their national security to be at risk and therefore feel obliged to take exceptional measures to guarantee their security and defence. It is understandable that major powers should be striving to develop defence mechanisms and start reinforcing their military capabilities in space, initiating an escalation of weapons development and a new militarisation of space, which is nothing more than a demonstration of the existing level of confrontation and the struggle to not be overtaken by the adversary.

This is similar to past events where the clash between two superpowers has resulted in the loss of power and decline of one of them, the most recent example being the decline of the USSR after the end of the Cold War. This time there are sufficient indications that the Western bloc of states will be forced to contain the direct confrontation of the Sino-Russian bloc and its allied states. This is an unavoidable situation, and it is expected that this confrontation will be waged in every sphere of power, from the diplomatic to the economic, political, cultural and social spheres. It goes without saying that this is also true in the military sphere, where one must be prepared to fight this battle in each of its operational domains. As well as in space (Castro Torres, 2020).

These developments have paved the way for the implementation of new security and defence strategies and policies, based on the motivation to preserve national security by defending the vital interests of the state. Today, this defence of national interests also includes the new space domain as a domain to be protected against new threats.

In military terms applied to the space domain, it is to achieve a sufficient degree of autonomy for the execution of military operations. This is not possible without the means to continuously monitor and assess the political and military situation, both in peacetime and in crisis; and requires the necessary capabilities, suitable number of and scope of sensors, as well as command and control structures, in accordance with a decision-making process, both short and long term (Martínez Cortes, 2020a).

In this new confrontational scenario, it is necessary to equip ourselves with tools to improve space surveillance and defensive capabilities to protect space assets, in orbit such as satellites or on the ground such as ground segment elements. At the same time, there are tools to reduce reaction time to unforeseen situations. There are a number of national and international implications regarding how to respond to these needs, which pose a real challenge to the FF. AA. The EA faces a new and unprecedented

challenge. Only an appropriate optimisation of existing resources can ensure that these objectives are achieved (Sánchez de Lara, 2020).

2.4. Militarisation in space

Initially, the major concern in terms of space security was Planetary Defence against stars that might collide with the Earth. As was safety in the operation of space systems, in order to avoid possible accidents or space failures and their detrimental effect. However, in recent years, the risks and threats to space security in terms of state security and defence have increased.

The environment of cooperation in space where international consensus was followed and where scientific and commercial interests prevailed, has given way to an environment of confrontation where rivalry and conflict are widespread and where space plays a central role in preserving national interests and security (Jordán, 2023).

Space has become an increasingly contested environment, not only for military but also for civilian activity, which has grown exponentially in recent years. Thus, taking into account the economic value of space assets, both civilian and military, the services they provide to society and its dependence and security in relation to them, it may be assumed that they should be subject to a high degree of protection (Martínez Cortés, 2023).

A priority review process is underway to emphasise the need to assess security and defence risks, together with the search for synergies to ensure operational safety. International civil-military and public-private cooperation is essential.

Militarisation or the use of space for military purposes is inherent to human activity in space. In fact, as discussed above, just after the end of the Second World War, the United States and the USSR embarked on the development of military satellites.

The USA launched its first military observation satellite in 1960, followed by the Soviet Union in 1962. Their purpose was above, military, and military satellite launches accounted for three quarters of the total launched during the Cold War.

The new space race seeks to establish permanent human settlements on the Moon. A project of epic dimensions that twenty years ago would have been the plot of a science fiction novel and an unattainable goal. Today, however, technological advances make this possible.

Due to the environment of confrontation and mistrust between adversaries vying for the mineral resources of the lunar body, these programmes to establish lunar settlements require protection and, therefore, the deployment of military forces to defend US space-based interests.

The US, and by inference also China, are engaged in a secret arms race to develop new weapons systems that may be used on lunar bases. In this new context of

increasing militarisation, authors such as Al-Rodhan (2018: 32-33) express the following considerations: "Outer space is in danger of becoming a battlefield [...] Space is an area that should be used to strengthen our collective security, not weaken it. It is imperative that states begin, as soon as possible, to agree on ways to ensure the safe, peaceful, and responsible use of space in order to guarantee our security now and in the future".

When considering the legal status of space, it is crucial to understand that the OST prohibits only the use of weapons of mass destruction. It does not prohibit the deployment of conventional weaponry.

In this regard it is necessary to distinguish between the terms militarisation of space and space weaponisation, since militarisation of space in international law refers specifically to the military use of a space system, but not to the use of weaponry. However, space weaponisation is defined as the placement in space, for any period of time, of any device designed to attack from space targets located in space or on Earth.

However, weapons deployment in space is always considered a form of militarisation; the militarisation of space via the use of military spacecraft does not necessarily imply the deployment of weaponry. In this way, a distinction may be made between military capabilities that are deemed weaponisation and offensive, and others that are not.

Under this broad definition that characterises today›s space environments, virtually all space objects are dual-use and may be used for military or civilian purposes, with commercial space systems providing extensive services to the military.

At the national level, the planning document Panorama of Geopolitical Trends Horizon 2040 defines the militarisation situation as follows:

> "The growing importance of the use of outer space will offer multiple possibilities for the benefit of society, but free access and use will also be restricted by those who have the capacity to do so. [...] The possibility of deploying weapons systems and the need to protect assets in orbit will lead to a progressive militarisation of space" (Instituto Español de Estudios Estrategicos (IEEE), 2019: 30).

This need to protect assets in orbit, and the fact that space is becoming increasingly important for security, has led major organisations such as NATO to adopt a new space policy and to declare space as an operational domain in 2019, alongside land, sea, air and cyberspace.

The importance of space assets in the Alliance was reflected at the Brussels Summit in 2021, when it was recognised that "attacks to, from, or within space present a clear challenge to the security of the Alliance [...] could lead to the invocation of Article 5 (of the North Atlantic Treaty)" (Organización del Tratado del Atlántico Norte (OTAN), 2021).

In 2019, several NATO member states made decisive changes to their space policy. For example, under Donald Trump, the US created the US Space Force as a separate

and completely independent service from the US Air Force - although for several years, the two services formed a single unit called the Air and Space Force.

The US Space Force is responsible for defence-related aspects of space. It is a new service that has been equipped with specific financial, material and personnel resources for space colonisation, beginning with the stars closest to Earth.

Until now, major space powers have developed some form of military capability to enable them to defend their space assets or deny their adversaries the use of space. For their part, both France and the UK have created space commands within their armed forces. But one of the differentiating aspects of the implementation of spatial capabilities is how the concept of the space operational domain is interpreted. It is not the same among allied nations such as the US, France, the UK and Italy. Each state interprets it differently and according to its particular circumstances.

For example, the US considers the space domain as more of a warfighting domain than a simple operational domain supporting operational domains such as land or sea. It believes that specific and offensive military operations may be conducted in space. This will require the development of military space assets and an armed forces with an operational structure adapted to its defence policy targets.

The US justifies the militarisation of space, including the moon, as the only way to counter China´s ambitions. At the same time, however, China and Russia have criticised the creation of the US Space Force as weapons proliferation in space.

France, for its part, although highly active in the space domain, has opted for a more conservative interpretation than the US, continuing to execute space missions to and from space for the time being, but not in space. Its space force is part of aviation alongside aerospace, as a single service called the Armée de l›air et de l›espace. However, the change of name reflects the growing importance of the space segment and, for this purpose, it also imitates the US in setting up independent operational command and control structures. Therefore, it cannot be ignored that the progressive advance of technology will allow expeditionary missions in the future (Martínez Cortes, 2020a).

The UK has also implemented major changes, but, unlike the US and France, it has not assigned this enterprise to the Royal Air Force (RAF) but has developed a unique model with joint command and control structures and personnel from all services, in contrast to what its NATO allies have been doing.

At the moment, NATO is at the opposite end of the US. Currently, the Alliance›s stance has been more moderate than those of some of its member states, such as the United States. conditioned by a lack of its own means and total dependence on the capabilities provided by its members (Martínez Cortes, 2020a).

According to the Alliance, the space operational domain does not include the operation of armed space assets and according to the OST, its functions will be limited to conducting space operations in support of military operations on Earth (Organización del Tratado del Atlántico Norte (OTAN), 2021). This is in line with the

international policy of many of its member states, which are also EU member states, committed to the peaceful use of outer space.

Given the dimension of space, space security within NATO will require alliances between space powers, where information sharing will be crucial.

2.5. Security strategies in space and the challenges for the Spanish Armed Forces

Spain's status as a member of the EU and NATO is a decisive factor in the development of national space strategies and policies, which must be aligned with those of international organisations. Similarly, national interests must be placed at the service of the general interest together with other Member States (Azcárraga Arana, 2014).

Until now, the security and defence strategies of these two organisations were significantly different in terms of certain relevant defence-related aspects. However, recent changes in the geopolitical landscape and armed conflicts in Europe, Asia and the Middle East have prompted the EU to review its defence policies.

With regard to space, the recent promulgation of its new security and defence strategy in 2022, called the Strategic Compass, reflects the EU's shift towards more assertive defence policy that addresses current risks and threats, and is determined to use force when necessary (Consejo de la Unión Europea, 2022).

It represents a substantial change in the space domain which envisages the development of a space strategy and the need for increased security through civilian and military means. This explicit mention of aspects of space defence and the use of space assets demonstrates the increasing importance of space in security and defence matters.

Following the NATO Summit in Madrid, the Alliance also published its new Strategic Concept in 2022, which also noted that threats in space pose a serious security risk to member states. However, the Atlantic Alliance, unlike the EU, does have a permanent military structure with dedicated means, which allows it to develop all of these strategies and major security and defence policies.

NATO, unlike the EU, conducts military operations in space and therefore requires its members to acquire space capabilities in support of the Alliance. These include two of the aforementioned capabilities: space situational awareness, which makes it possible to identify the perpetrators of actions against space interests, and the ability to detect the launch of intercontinental missiles.

Through their security and defence strategies, both the EU and NATO have appealed to member states to urgently develop space capabilities and place more resources at the service of space. An increase in material, personnel and financial resources is required to cope with the demand for these space services.

At the national level, Spain is following the trend set by international security and defence organisations and has initiated a policy of organisational transformation and provision of necessary space capabilities. This poses a challenge for the FF. AA, and specifically for the EA, which is responsible for identifying operational needs, acquiring and operating military systems, as well as training and educating the personnel who will later constitute the SAF's space capabilities.

The various priority areas identified by NATO, and which result in national contributions to the Alliance, include the following:

– Permanent activation of space surveillance centres and command and control structures at different levels, both within the Alliance structure and in Spain, which will require an increasing number of personnel.

– Full interoperability between national and multinational centres and agencies, many of which are newly established or still in progress.

– Personnel training and subsequent unit-based training.

Space as an operational domain is not an exclusively military domain, and the space domain also involves numerous actors from different sectors, both public and private, civilian and military, national and international. Similarly, the development and operation of the FF. AA' space capabilities do not take place in isolation but require complex coordination at all levels and in different areas.

In Spain, governmental competences and responsibilities on outer space have been assigned to seven different ministries. An excessive number of public bodies may lead to inefficient management due to the resulting slowdown, as well as a systemic lack of coordination in public administration. This has become evident with the exponential increase in space activities, and which has boosted the creation of the Space Council and the Spanish Space Agency (*AEE* after its abbreviation in Spanish) in 2022, whose Statutes were approved on March 8, 2023 by Royal Decree 158/2023.

These two Spanish governmental institutions are tasked with alleviating current problems and reversing the situation in order to have a national law that regulates space activities. A space law that would facilitate economic and industrial development in our country and seize the opportunity to integrate civilian and military operations.

Over the last five years, several Security and Defence documents have been promulgated in Spain, which constitute the reference framework for the application of activities in outer space and which have implications for national security. These include:

– The 2021 National Security Strategy (NSS)

  It expresses concern regarding shortcomings in space as "the lack of regulations facilitates irregular activity in outer space and hinders the protection of strategic assets such as satellite communications, positioning and timing systems or earth observation satellites" (Departamento de Seguridad Nacional (DSN), 2021: 63).

Previously, the 2019 National Security Strategy (NSS), had identified gaps in national space legislation and the need to regulate the space activities of private operators. Such space activities are deemed ultra-hazardous and therefore a matter of national security, requiring an obligation to ensure the safety of space infrastructures, which are critical to society today and are exposed to multiple challenges and threats (González Ferreiro, 2021).

- Within the scope of the Ministry of Defence, the Operational Environment 2035 studies the characteristics of the operational environment in each operational domain, including space, and reflects on the changes to be faced by the Armed Forces in order to successfully adapt to this uncertain and complex environment.
- Royal Decree 524/2022 of June 27, 2022, which establishes the new name of the Air and Space Army, highlights the importance of outer space within the security and defence framework, emphasising the essential role to be assumed by the FF. AA in the protection and control of space, as well as the leading role of the Air Force in this environment.
- Ministerial Order DEF/264/2023 of March 16, which implements the basic organisation of the EA. The concept of the Air and Space Force is introduced and the Operational Space Command (MESPA) is created. According to the aforesaid Ministerial Order: The creation of this new command body in the EA, the MESPA, will make it possible to centralise the preparation of its units, as well as the direction, planning, organisation and coordination of the functions that make space surveillance, control and operations possible" (*Ministerio de Defensa*, 2023a: 41857).
- Ministerial Order DEF/1110/2023, of October 4, which implements the basic organisation of the Office of the Chiefs of Staff, on the creation of the Operational Space Command (MOESPA) and the Space Component Command; shall enable: "The adjustment of the FF. AA' organisational structure to better meet the increasing challenges of outer space also has an impact on the operational structure, as the latter is reliant on the former. Thus, it is necessary to reorganise the operational structure such that there is better correlation with the organisational structure" (*Ministerio de Defensa* (MINISDEF), 2023b: 136015).

On the other hand, within the civilian sphere and in line with the above-mentioned EU responsibilities, it is worth mentioning the strategic agreement between the EU and ESA, which formalises the collaboration between both organisations to jointly develop a single policy for the use of space assets for a common interest.

3. Conclusions

The theoretical currents of the realist school represented by Dolman (2001) advocate a geopolitical reality of space based on world domination through control

of space, which may be formulated as follows: a global superpower seeking to exercise hegemonic power on Earth must be able to exercise control in outer space.

In other words, a superpower must achieve an optimal degree of strategic autonomy in space and therefore have the necessary assets to be a decisive actor in the event of a potential conflict that affects the space domain.

The possible confirmation of this hypothesis on the geopolitical importance of space and the need for adequate means to confront a potential adversary in space, leads one to think that generalised instability and conflict, as is currently the case, will be accompanied by a progressive increase in the militarisation of space and even an escalation in weaponisation.

As has happened in the past in other similar contexts of economic confrontation between states, progressive militarisation in space gravitates to the existential need of states to maintain their developmental status and wealth, especially as the space segment increasingly represents a significant percentage of their economies. Conversely, a degradation of a state›s space services would pose a risk to its national security, which could justify an arms race in space.

For the time being, the powers have begun to take protectionist measures related to the security and defence of space. They include enacting new laws that reinforce the legal framework and regulate space activity; to creating public, civilian and military bodies to strengthen state action, or signing of international agreements and treaties to participate in multinational projects with other allied nations.

These protectionist measures have also been applied in the field of security and defence by reviewing national security strategies, complemented by the enactment of new defence policies aimed at strengthening the Armed Forces and developing new military capabilities required to operate in this new operational domain: outer space.

This regulatory process of nations confirms that there has been a change of cycle where the previous multinational cooperation between rival powers is fading away, to be replaced by a new scenario of international confrontation, accompanied by increased space risks and threats, which endanger stability and world order.

The response among leading nations has been unanimous and has led to the transformation of many of our neighbouring armed forces. In most cases, this response has boosted the creation of new organisational and operational structures for space operations.

However, this response has been uneven among Spain's neighbouring allies, and the level of ambition of each nation has been based on its national needs and interests, its risks and threats, its resources, and so on. The response on how to conduct military operations in the operational domain of space and the capabilities to be developed is also uneven, as is the way in which military activities in space are managed.

However, space-related issues are constantly evolving and more and more states are joining the reformist movement to reshape the military operations environment.

First came the traditional physical domains, land and sea, then air; recently it has been extended to non-physical domains such as cyberspace and the cognitive domain, and finally we arrive at the space domain, as a medium that will revolutionise military operations.

NATO considers space to be an operational domain from which space operations supporting military operations on Earth are carried out. This concept of military use does not contemplate the weapons use or deployment in this environment, one consistent with the foreign policy of many of its member states who are committed to the space treaties for the peaceful use of outer space and the non-proliferation of weapons of mass destruction.

However, for other nations such as the US, the space domain is more than that, it is a combat domain and therefore an environment in which specific military operations require dedicated military assets.

The US has developed an operationally structured Armed Forces that fits the ambitious nature of its defence policy and has both offensive and defensive military space systems, some of which are orbiting the Earth. It is a demonstration of its enormous capabilities in this regard, which very few other powers currently possess and which gives it a clear advantage in the arms race in space.

In Spain, it has become a priority for the EA to adapt the Armed Forces to the new operational domain, unrivalled by any other target, in order to be able to define the necessary capabilities to fulfil the mission entrusted to it and to provide security and defence for space assets.

An organisational and operational adaptation whose priority is to be aware of events within the space of national interest. This means having a global database of space systems and space debris and space surveillance aswell, in order to identify irresponsible uses of these systems and to activate the required defence measures in the event of an act that may be deemed hostile.

Currently, there is already an organisational command, the MESPA, which is part of the Air and Space Army of the EA; and an operational command and structure, the MOESPA, for permanent operations, and the MCESPA, for crisis or conflict operations.

There are also two specialised units in the space domain: first, the Centre for Aerospace Observation Systems (CESAEROB), responsible for managing Earth observation imagery; and second, the Space Surveillance Operations Centre (COVE), responsible for space situational awareness and which is part of the national warning system for possible uncontrolled re-entry of space objects.

In the future, it is intended that Spain will have all assets required to ensure an adequate level of deterrence against unlawful acts such as those that occur on a daily basis in peacetime and which affect public services.

On the other hand, the goal is also to be able to prevent, jointly with its allies, possible attacks in space, such as the recent attack on communications satellites during the invasion of Ukraine.

As may be seen, in national terms, Spain is undergoing a change of phase in the field of security and defence promoted by geopolitical instability, which endangers its space assets, its economic development and its national security.

The FF. AA is undergoing a process of military transformation unparalleled in recent decades. A process that will be a historic feat, rather than just a challenge, due to the magnitude of the task at hand. Operating in a new domain such as space, in an environment where the laws of physics defy humanity and where disruptive technologies set the pace, is an undertaking that will require a complete rethinking of familiar concepts and models. A project that will change the world.

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