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# Taking Stock of the Space Weaponisation Issue

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## Introduction

For more than twenty years, space has been at the heart of the transformations that have taken place in our military organisations. Space has been conceptualised, it has become the Alpha and Omega of the modalities of intervention of our armies. It is currently impossible to imagine any military planning – no matter its scale – without the contribution of space in the fields of imagery, navigation, early warning or strategic and tactical communication.

The importance of space has also led to the emergence of new concepts: *Space Dominance* and *Space Control* are regularly used by military experts and practitioners, particularly in the United States. What do these notions cover? Where do they originate from and what are their implications? This is what we will try to examine. We will also discuss the difference between *militarisation* and *weaponisation* of space. Can we really distinguish these two concepts? How did they emerge? As we will observe, space *weaponisation*, even at the height of the Cold War, was a scenario that both the United States and the Soviet Union wanted to avoid at all costs. Does the prospect that this scenario may become reality no longer seem to be ruled out today?

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# What Are We Talking About?

It is now commonplace to observe that, if the conquest of space has resulted in all the achievements and applications that have invaded our daily lives and all sectors of activity, it is largely due to the dynamics of the global military competition in which those achievements took shape. However, when we focus on the relationship between space and the military domain, several eras must be distinguished.

### *Militarisation: Towards Strategic Space (1945 - 1989)*

The first era is, strictly speaking, that of the *militarisation* of space. As we can observe, *militarisation* is not only a concept, but also a periodisation resulting from the very specific nature of the relationship between space and strategic issues. After identifying the era of space *militarisation* in 1985, Paul B. Stares, attributed this era to the time period between 1945 and 1984 (Kevles, 1987). We can reasonably extend this period to 1989/1990. The main virtue of *militarisation* as a concept, in a bipolar world, caught between two nuclear superpowers, consisted in preventing a global conflict. In the context of the Cold War, this *militarisation* of space guaranteed the maintenance of a certain level of mutual security which, although it was based on the subtle mechanisms of nuclear deterrence, provided the two main protagonists with means of observation, anticipation, prevention and mutual control of their arsenals, installations and force deployments (Benson & McDougall, 1986; Kevles, 1987). The concept of nuclear balance between the two superpowers supposed that each of the rivals was able to observe the adversary's capabilities (DeBlois et al., 2004). US satellites were primarily deployed for pre-conflict planning, strategic and tactical warning, and monitoring treaties. US space assets were primarily "tasked" with focusing on the Soviet threat. If deterrence were to break down and a conflict were to erupt, space assets would have been used for communications, command and control, along with battle damage assessment and ballistic missile launch warning. Moreover, the mechanism of the *détente* reinforced this need. In other words, the space race made it possible to ensure strategic stability between the United States and the former USSR (Lewis & Allevione, 2007).

During this period, both superpowers took great care to prevent the arms race from degenerating into weaponisation. During his term, President Jimmy Carter decided to hold talks with his Soviet counterpart in the view of "limiting certain activities directed against space objects" (United States Government Printing Office Washington, 1979, p. 1137). On 8 June 1978, American and Soviet negotiators held the first discussions in Helsinki on the establishment of standards for anti-satellite weapon (ASAT) control measures. Truly, the Soviet Union had, at the time, a notable lead in the field of anti-satellite technologies. The United States, for its part, had just launched its own ASAT programme based on an air-to-air missile. The US aimed at making the Soviet Union fearful of a costly escalation in the acquisition of ASAT systems and of convincing the latter to join the negotiations. The USSR's invasion of Afghanistan put an end to the negotiations which were then at their fourth preparatory meeting (Hafner, 1981).

During these decades, both superpowers competed intensely on military technologies that were perceived to offer significant payoffs. Substantial efforts were dedicated to laser testing, production, and deployment of weapon systems supposed to exert an impact on

the strategic balance. Comparatively, the two protagonists put little effort into developing credible ASAT capabilities. Throughout the East-West confrontation period, no less than 1,000 intercontinental ballistic missile launchers were maintained in service by the United States. By contrast, between 1964 and 1975, Washington installed only two ASAT interceptors in the Johnston Islands in the Pacific. Similarly, the United States and the Soviet Union carried out no less than 1,700 nuclear tests. In comparison, they tested rudimentary ASAT weapons 53 times, with US tests primarily taking place between 1963 and 1970. Soviet flight-testing of ASATs was confined to two periods: 1968 – 1971 and 1976 – 1982 (Kevles, 1987).

Certainly, President Reagan's Strategic Defense Initiative (SDI) and the Star Wars project it incorporated should have allowed the installation of armaments in orbit. This development, if it had materialised, would have been devastating to the military balance. Considerable investments – we are talking about hundreds of billions of dollars – were devoted to the development of the projects contained within the SDI. We know what happened with those investments: a considerable part of the planned funding essentially went to military R&D programmes incapable of yielding the "technological exotic" weapons that were supposed to be deployed.

### *Operational Space (from 1990 until today)*

With the end of the Cold War, space acquired an additional and more "operational" status. Surely, we are not witnessing a total disappearance of space as a "strategic asset" aimed at monitoring nuclear powers in a deterrence framework. Space technologies continue to support monitoring activities contained in several treaties. However, especially for the United States, the need to make the billions of dollars of investments in favour of the SDI worthwhile, now devoid of any *raison d'être*, became an urgent matter. The US then decided to put space at the service of military operations on the ground, mainly in a geopolitical context marked by the emergence of "revisionist" regional powers that, taking advantage of the strategic vacuum left by the Cold War, sought to reshuffle the cards of influence on the international scene.

It is widely shared that *Operation Desert Storm* (1991) was the first military campaign to make extensive use of space technology. Yet it was not. Or, at least, not in the way it is commonly suggested. During *Desert Storm*, none of the munitions fired by the US Air Force were guided by satellites. Nevertheless, satellites served as useful tools for terrain recognition, observation of enemy troop movements and the identification of critical targets (even though the concept of *time critical targeting* was not yet theorised). The contribution of space and navigation satellites for smart munitions in particular has become increasingly important during the 1990s. During Operation *Allied Force* in Kosovo, only 3% of such munitions used GPS technology. This percentage increased to 32% during the *Enduring Freedom* campaign in Afghanistan. Let us further add that satellite communication is used more intensively in the course of various major operations. While the United States armed forces exchanged approximately 100 megabits per second in 1991, this level rose to 10 gigabits in 2003, nearly 100 times the amount of bandwidth used during *Desert Storm*.

However, the operationality of space did not go without creating a certain number of technical difficulties, especially regarding the degree of precision of early warning systems. Significant modifications to the calibration of the sensors of satellites used for the detection of missile launches had to be carried out. Most US satellites dedicated to early warning were indeed

calibrated to detect Soviet intercontinental missiles whose boosters were known to burn for a long time in the atmosphere. This could explain why, during the *Desert Storm* campaign, short-range missiles escaped the "vigilance" of early warning satellites: the tracked missiles had a weaker signature. It was therefore paramount to make the sensors more sensitive. However, such an adjustment led to another problem: the satellite's ability to correctly discriminate the tracked objects. By making the satellites capable of detecting a greater quantity of objects – not all of them being missiles – the United States was compelled to improve the processing systems by adding algorithms that are more powerful. This obsession to visualise every action or object in space was at the source of many additional costs, sometimes over 350%.

In the aftermath of *Desert Storm*, the US armed forces became aware of the contribution that their space assets – which were essentially designed within the framework of the Cold War – could represent for the conduct of future operations in distant and varied theatres. The technologies on board of US satellites then led the US Department of Defense to establishing new doctrines, often grouped under the name of *Revolution in Military Affairs* (RMA). In the wake of this RMA, so-called "breakthrough" approaches emerge, such as *Network-Centric Warfare, Parallel Warfare, Effect-Based Operations, Global Prompt Strike*, etc. This unprecedented doctrinal explosion was aimed at making the US armed forces capable of confronting the entire spectrum of violence. To this end, space technologies were deemed a major tactical asset.

During the 1990s, the space sector also entered in an era of commercialisation. The United States very quickly sought to make the technologies developed during the Cold War profitable. The new expeditionary military operations could not by themselves justify the monopolisation of particularly expensive programs by the public authorities. Therefore, the Clinton administration opened space technologies to the private sector. With the rise of the new space entrepreneurship, the interdependence between science, industry, politics and society has grown steadily in the space domain.

### *Space as the Future "High Ground": The Ineluctability of Weaponisation?*

The growing dependence of the US armed forces on the most diverse space technologies gave rise to new fears. In January 2001, a commission chaired by Donald Rumsfeld (who would shortly afterwards be assigned as the US Secretary of Defence of the George W. Bush administration), draws attention to the risk of undergoing a new "Pearl Harbor" which, this time, would result from an attack on US space capabilities in the context of an asymmetric warfare scenario. The report resulting from the work of the Rumsfeld Commission then envisaged the scenario of *Space Weaponisation*, labelled a "virtual certainty" by the Commission members. The virtual certainty of space weaponisation was then further defended by the advocates of what would later become major themes of the US strategic debate *Space Dominance* and *Space Control*.

The idea of *Space Control* first appeared in 1998. It was conceptualised by a US Air Force officer, Lieutenant Colonel David E. Lupton (Lupton, 1998). *Space Control* is one of the four components of *Space Power* alongside *Space Sanctuary, Space Survivability* and *High Ground*. Within the framework of this doctrine, space is theorised as the vector of US hegemony in the post-Cold War era. Since the 1950s, space has become not only a means of international influence but also a field from which new surveillance technologies can be deployed. Space

allows a "tactical superiority", materialised during *Operation Desert Storm*; it is also a critical driver for *Information Dominance* thanks to new information and communication technologies, the well-known ICT.

In the context of *Space Power*, the notion of *Space Control* describes space as a brand new theatre of operations – in the same way as the land, sea and air domains – in which the industry is allowed to exploit resources for trade. More formally, *Space Control* can be defined as a set of tools and doctrines "[e]nsuring U.S. and allied freedom of action in space and, when necessary, denying an adversary that freedom" (DeBlois et al., 2004, p. 63). This approach results in the need to occupy space, dominate it (*Space Dominance*) and militarise it. In other words, it can be supposed that, by the end of the 1990s, the foundations of *New Space* were already established.

The development of means for *Space Control* also implies a *Counterspace* strategy that the United States breaks down into three types of resources:

1. resources dedicated to space surveillance thanks to terrestrial radars and space assets ;
2. resources aimed at defending US satellites (they include the radiation hardening of telecommunications satellites, electronic jamming, changes of orbit, responsive space assets, satellite replication or even the deployment of small satellite constellations) ;
3. finally – and this was the most worrying proposal of the programme –, the development of means of attack on enemy systems (e.g. laser, anti-satellite weapons in orbit or other destruction capabilities).

For the US, space must serve an overall deterrence posture, which includes, besides nuclear deterrence, a *Global Prompt Strike* capability. This capability should be based on a *Common Aero Vehicle* launched from a missile or an aircraft. Is this the purpose of NASA's X-37B drone? There is still much uncertainty about this "black" programme.

## Could We Avoid Weaponisation?

Will it be possible to avoid space weaponisation, a scenario that has been successfully avoided in the past by the two superpowers? In other words, will we be able to prevent tomorrow what we were able to avoid yesterday? The ASAT test conducted by Russia on 15 November in low-Earth orbit, during which an interceptor of the Nudol ground-based ASAT system was used to destroy one of Russia's own derelict satellites, clearly indicates that the answer is far from certain. By putting at risk the ISS crew, this demonstration clearly confirmed not only the existence but also the persistence of a nascent and a potentially destabilising space weaponisation.

For more than two decades, nation's space activities have witnessed an unprecedented intensification and many transformations have accompanied this growth. A reasonable explanation for this trend is the concomitance of six phenomena that have had a lasting effect on the sector since the end of the Cold War.

A first phenomenon is the horizontal and vertical extension of digital technologies and networks. Horizontal extension can be explained by the fact that the overwhelming majority of societies on the planet today depend on the services provided or supported by the Internet. Vertical extension, on the other hand, is caused by the different strata of society, from the individual to the institutions, resorting to network technologies for the conduct of their respective activities.

A second phenomenon stems from the increased number of states now having developed a space policy, either because they have managed to develop their own scientific and technological infrastructure to deploy their launchers, satellites and associated services (i.e. China), or because they can use space resources from partners within the framework of industrial cooperation. Some of these states (like China), which have long remained in a phase of "technological catch-up", are now competing with historical players. The various ASAT tests carried out by China since 2007 were credible enough to convince the United States of the benefits of retaliating with similar manoeuvres.

A third phenomenon is the qualitative diversification of scientific and technological actors implementing a space policy. States that long remained the dominating players in this sector have been constrained to share this "exclusive area" with private entrepreneurs (Denis et al., 2020). In this regard, it is important to define the scope of this transformation. Private entrepreneurs no longer act as mere subcontractors for public authorities; they also develop their own space policies and define their programmes according to their own market and growth objectives. SpaceX has its own satellite constellation programme for the Internet, called Starlink. Amazon, for its part, is working on the deployment of its Kuiper constellation.

A fourth phenomenon is the "institutional sanctuary" formed by the space domain within defence organisations. By establishing a Space Force, the Trump administration has brought about an old project, i.e. a relative empowerment of the military space sector in relation to other "services" (Air Force, Navy and the Army). Other states have followed the example of the United States. France has instituted a Space Command, supported by a Space Defence Strategy on 25 July 2019. Russia established the Russian Aerospace Force (VKS) as a new branch of its military in 2015 by merging the Russian Air Force (VVS) and the Russian Aerospace Defence Forces (VVKO). Japan has set up the Space Operations Squadron (SOS). Similar endeavours can be found in the United Kingdom, Germany and Austria. NATO, for its part, has designated space as an operational environment in its own right to justify the creation of a command centre in Germany specifically dedicated to space defence issues.

A fifth and final phenomenon is *space domain congestion* (Shabbir et al., 2021), resulting from the competition between states and private firms for the occupation of space (*Space Dominance*). Today, voices are being raised to alert public opinion, decision-makers, but also companies, to the risks that this unbridled entrepreneurship could present to the continuity of services. If deregulation were to become the norm, this could have dramatic effects on guaranteed access to space for nations. In this context, the Kessler syndrome (Adushkin et al., 2020) has recently resurfaced and, with it, concerns about the future of the space ecosystem. Originally developed by two NASA astronomers – Donald J. Kessler and Burt G. Cour-Palais – in an article published in 1978 (Kessler & Cour-Palais, 1978), the concept of "cascading collision" (unfairly reduced to the "Kessler syndrome" label) aimed at describing the physical and mechanical principles governing the formation of planetary rings from asteroids and meteorites agglomerations. These principles were then transposed to the study of low-Earth

orbit pollution. Low and geostationary orbits, where most of our military satellites are located, are particularly vulnerable. Low orbit is home to most of our remote sensing, space imagery and communications capabilities. The hypothesis of a "Kessler – Cour Palais" scenario would prove devastating not only for the future of space programmes, the safety of launchers or the future of scientific missions but also, in a worst-case scenario, the safety of aircrafts, ground populations and the survivability of the International Space Station (ISS). Yet, these hypotheses could prove even more dramatic: the possible destruction of a military satellite by an uncontrolled object or debris generated by a fortuitous collision – possibly in cascade, with repercussions on other systems belonging to other nations or organisations – would have serious consequences for peace between the space powers as they could mutually accuse each other of attempting to start a major conflict.

A final phenomenon is the disruption of most of the major agreements that have forged international security since the dissolution of the Soviet Union. This trend is not without impact on the nature of relations between states in the medium and long term. While this development is largely due to the reminiscence of power policies among the former "major signatories", it could also be perceived as the result of the very absence of control, limitation or reduction regimes.

## Conclusion
## Is Space Arms Control an Illusive Objective?

Although they could be improved, major regimes of arms security, control, limitation or reduction, had the advantage of establishing frameworks for exchanges between diplomats, military and observers. They contributed to building a "common grammar" among states. Their dissolution is particularly worrying in the context of the current technological race. The question arising today about the future of space can be summarised as follows: to what extent will the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, endure as the bedrock of peace and security in space?

Moreover, it should be underlined that the five major space treaties, which constitute the basis for the regulation of activities in space, were negotiated at a time when the debris issue was not on the agenda. This international legal framework also took place in a period where space was first considered a *res communis*. That was the philosophy prevailing during the establishment of very general principles whose objective was to preserve the freedom of use of space.

It should also be noted that, in outer space, only the placement of nuclear weapons (Art. 4, 1st alinea, of the 1967 Outer Space Treaty) is strictly prohibited by international law. Conventional weapons are only prohibited on celestial bodies and the Moon. Moreover, the principle of the use of space for peaceful purposes is not expressly laid down in the 1967 Treaty and is subject to many interpretations.

Finally, there is still uncertainty about the binding value of all these legal provisions. In recent years, multiple blockages have prevented an evolution of space law. These blockages were sometimes the result of diplomatic manoeuvres like those of the Russian and Chinese delegations within the framework of the PAROS[2] process within the United Nations. Gradually, it seems that space law is evolving towards more technical and less restrictive recommendations, intended to encourage as many states as possible to join a new reflection on the future status of outer space. The choice of such a strategy results from the reluctance expressed by many actors about the principles that should rule a new and more adapted framework for space activities. It is also a risky political gamble that confirms once more the difficulty of maintaining an effective regulating regime. All these reasons help explain why it is very unlikely that, in the coming decades, we will establish a genuine *Arms Control Regime* for space activities.

## Bibliography

Adushkin, V. V., Aksenov, O. Y., Veniaminov, S. S., Kozlov, S. I., & Tyurenkova, V. V. (2020). The small orbital debris population and its impact on space activities and ecological safety. *Acta Astronautica*, 176. https://doi.org/10.1016/j.actaastro.2020.01.015

Benson, S., & McDougall, W. A. (1986). ... The Heavens and the Earth: A Political History of the Space Age. *Public Administration Review*, 46(6). https://doi.org/10.2307/976237

DeBlois, B. M., Garwin, R. L., Kemp, R. S., & Marwell, J. C. (2004). Space weapons: Crossing the U.S. Rubicon. In *International Security* (Vol. 29, Issue 2). https://doi.org/10.1162/0162288042879922

Hafner, D. L. (1981). Averting a Brobdingnagian Skeet Shoot: Arms Control Measures for Anti-Satellite Weapons. *International Security*, 5(3), 41–60. https://doi.org/0162-2889/81/030041-20

Kessler, D. J., & Cour-Palais, B. G. (1978). COLLISION FREQUENCY OF ARTIFICIAL SATELLITES: THE CREATION OF A DEBRIS BELT. *J Geophys Res, 83*(A6). https://doi.org/10.1029/JA083iA06p02637

Kevles, D. J. (1987). The Militarization of Space: U.S. Policy, 1945-1984 . Paul B. Stares . *Isis, 78*(2). https://doi.org/10.1086/354461

Lewis, J. A., & Allevione, J. (2007). La dynamique de l'arsenalisation de l'espace. *Politique Étrangère, Été*(2), 253. https://doi.org/10.3917/pe.072.0253

Lupton, D. E. (1998). *On Space Warfare: A Space Power Doctrine*. Alabama: Air University Press.

Shabbir, Z., Sarosh, A., & Nasir, S. I. (2021). Policy Considerations for Nascent Space Powers. *Space Policy*, 56, 101414. https://doi.org/10.1016/j.spacepol.2021.101414

United States Government Printing Office Washington. (1979). *Public Papers of the Presidents of the United States: Jimmy Carter.* Office of the Federal Register National Archives and Records Service General Services Administration.

[2] Preventing an Arms Race in Outer Space.

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