International Competition in Space. Political and Technological Challenges in the 21st Century

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Abstract: Technological progress in the field of space exploration implies for the future a diversity of challenges determined mainly by the new type of cosmic power expressed through specific capabilities and resources. Although, at this time we are at the level of exploration, the development of technology involves the realization of a space infrastructure on the basis of which exploitation in the space field is increasingly possible. All the concerns, at the level of research and development of space technology, including debates on legal issues, point out that space mining is increasingly possible and with certainly that changes will occur in the forms of expression of national power at state level.

Keywords: outer space; globalization; international relations; technology; security

It is already known that in the process of globalization technology is "undoubtedly the first determining factor" (de la Dehesa, 2007, p. 19) and beyond all challenges and threats, regional conflicts, economic competition for resources and markets, a new revolution is taking place in which "conditions for the creation of space power appear (…)" (Moltz, 2019, p. 79). The challenges and technological ambitions for space exploration raise the issue that it should take place peacefully and especially that "the new cooperative approach is broad and (…) touches on all the most important topics of space science, technology and space policy"[2]. Referring to globalization through the multitude of aspects, "awareness of the process is relatively recent, which could account for the wisdom of what is (Dudley-Flores & Gangale, 18 - 20 September, 2007, p. 4)" and "space exploration is not outside the process of globalization (Dudley-Flores & Gangale, 18 - 20 September, 2007, p. 4)." As might be expected, "space is more than a technological problem. It has always had and will continue to have a strong political dimension that has not been properly developed so far at European level"[3].

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[2] Federal Ministry of Economics and Technology, *Making Germany's space sector fit for the future. The space strategy of the German Federal Government*, Berlin, 2010, p. 4. https://www.dlr.de/rd/en/Portaldata/28/Resources/dokumente/Raumfahrtstrategie_en.pdf.

[3] *Communication from the Commission to the European Parliament European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions EU Space Industrial Policy*, Brussels, 28.2.2013, COM (2013) 108 final, p. 3.

The evolution and "profound transformation of technology is causing significant changes in space[1]" and also "it seems reasonable that the role of space should be as essential to the study of astropolitics as was the terrestrial geography for the study of geopolitics (Bergesen, 2018, p. 169)." The beginning of this space industrial revolution is based on, among other things, "the search for perennial resources of clean energy (solar energy and other renewable energies), fuels for thermonuclear reactors (helium 3), space mining activities (planets, asteroids), the potential of the Moon for travel interplanetary, low costs for transporting materials to space construction sites (Abdul Kalam, 2008, p. 9)". Concerns about space mining will develop, among other things, a new economy.

Substantial investments of resources in space research and technological development aimed at the Earth's orbital space have become, among other things, "the object of military security planning. The strategic imaginary of the United States now includes securitization through and from orbital space, such as missile defense, space control, and the application of space force. Then, space weapons are no longer just a fantasy, an unachievable fiction, they are fast becoming a very real possibility" (Duvall & Havercroft, 2009, pp. 42-58).

For the future, the challenges of acquiring space power are immense in almost every field of activity on Earth. The competition in outer space, against the background of globalization, still in progress, will project a new type of power - space power that "is able to control the upper territory through surveillance and precise projection of force - control without occupation. While space power cannot result in dictatorships normally associated with terrestrial power, it would be a useful tool for creating a disciplinary society throughout the Earth (Duvall & Havercroft, 2009, pp. 42-58).

As stated in the 2016 European Space Strategy, "the space industry has the potential to be a catalyst for high economic growth and to strengthen Europe's role as a player and to have global influence (…), representing the second largest public space budget in the world"[2].

The fact that "space is becoming a more contested and disputed environment[3]" amid investment in research and development in both the public and private domain, it creates at the level of the international law some uncertainties that at least at this time aim at "amending the Space Treaty, considering that it arose at a time when commercial exploitation was incomprehensible and that attempts to

[1] *Space A Roadmap for unlocking future growth opportunities for Australia,* 2018, p. 5.
[2] *The future of the European space sector. How to leverage Europe's technological leadership and boost investments for space ventures*, The European Commission, 2019, p. 17.
[3] *Comunicare a Comisiei către Parlamentul European, Consiliu, Comitetul Economic și Social European și Comitetul Regiunilor, O strategie spațială pentru Europa,* Comisia Europeană/Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Space Strategy for Europe, European Commission, Brussels, 26.10.2016, COM (2016) 705 final.

change it in order to reach an international consensus would be risky and difficult" (Anderson, Christensen, & LaManna, 2018, p. 24).

At the same time, given that the treaty in question is not "prescriptive and that, however imperfect it may be, it creates a necessary foundation for international space activities, and rather lays down general rules which enable each nation its capacity to fulfill obligations in its own way (Anderson, Christensen, & LaManna, 2018, p. 24)".

Another option is for "issues of legal clarification to be achieved through bilateral and multilateral agreements between nations" (Anderson, Christensen, & LaManna, 2018, p. 24). In this context, the concerns of the Hague[1] Working Party on Space Resources Governance are relevant to "assess on a global scale, the need for an international framework for space resources activities and the preparation of the basis for such a framework"[2].

From the perspective of international relations, they will evolve "as we incorporate space into national security because the theory of international relations, such as the theory of social sciences, is generally contextual (Pfaltzgraff, 2013, p. 2). At the same time, given that "space is not the exclusive domain of governments, theories will also include private sector entities. In this sense, the current theory of international relations focuses on states and other non-state actors and has direct applicability" (Pfaltzgraff, 2013, p. 2). The emergence of the concept of spatial power "as a logical extension of the concept of power" (Pfaltzgraff, 2013, p. 2), in the vision of the theory of international relations, involves rethinking national security strategies and thus meeting national security objectives. From the perspective of national sovereignty, it extends in the sense that "state sovereignty can be projected into space, but only on objects sent into space, although outer space is from a normative perspective, still considered a common good accessible to all mankind, in fact only a few Wealthy states have been able to enjoy the privilege of exploring and exploiting the benefits of outer space."

Regardless of the civil, commercial, security or defense objectives of space technology, the effects are in economic growth, although there is some competition. In the future, we believe that the great challenge is to manifest a "spatial hegemony over the structure of the international system." Most likely, economic development through access to new energy resources will be able to strengthen democratic systems, cooperation between states and reduce conflict. Beyond the huge budgets allocated, public or private, another major challenge is the security of access to space and the conduct of space activities, in particular the extraction, transport and use of resources, especially since "space is currently part of a global value chain, which attracts more and more enterprises and new

[1] The Hague Working Group on Space Resources Governance was set up following a round table on space resources governance, convened by the Hague Institute for Global Justice on 1 December 2014.
[2] *Committee on the Peaceful, Uses of Outer Space*, Legal Subcommittee, Fifty-seventh session, Vienna, 12 April 2018.

entrepreneurs" who by "allocating space resources will configure the utility only after there will be an infrastructure". The current state of the globalization process highlights that "what has developed over time is a circular dependence: technologies create new economic opportunities and create large markets for profitable investments in infrastructure with multiplier, subsequent terrestrial businesses." Regardless of the involvement of private companies or government space agencies, "the future of asteroid mining as a lucrative industry also depends on the existence and growth of a robust space economy." The most likely challenge for the future is "the interaction between outer commercial space and national security space that will become more difficult to manage as more satellites begin to populate the orbital space."

In conclusion, we appreciate that beyond the legal debates, technology is in a continuous process and it is obvious that many of the results are not public for competitive and security reasons. Such concerns encourage international cooperation in the field of space technology research and development, which can also lead to the standardization of an international framework for space mining. Along with all this, the aim is to identify risks and vulnerabilities to increase the safety of space activities but also to maintain the benefits created. The new space economy will diversify the forms of interconnectivity and interdependence between states, international and transnational cooperation.

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