

Space strategy and policy: analysis of the Indian case

Estrategia y política espacial: un análisis del caso de la India

Estratégia e política espacial: análise do caso indiano

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ABSTRACT

This paper proposes to analyze the debate on space policy and space strategy in general, based on works by selected authors who also discuss the military use of space resources, as well as the importance of space control for strategic decisions and of space power analogy with maritime and air power. Based on that, it intends to briefly analyze the thinking of the authors who approach this issue in the Republic of India and to verify how they understand the development of these capacities within the country, in a regional context of tensions and disputes with countries like China and Pakistan, as examples.

Keywords: Strategy. Space. India. Policy.

RESUMEN

Este artículo propone analizar el debate sobre política espacial y estrategia espacial en general, basado en trabajos de autores seleccionados que también discuten el uso militar de los recursos espaciales, así como la importancia del control espacial para las decisiones estratégicas y la analogía del poderío espacial con el transporte marítimo y poder aéreo. A partir de esto, se pretende analizar brevemente el pensamiento de los autores que abordan este tema en la República de la India y verificar cómo entienden el desarrollo de estas capacidades dentro del país en un contexto regional de tensiones y disputas con países como China y Pakistán, como ejemplos.

Palabras clave: Estrategia. Espacio. India. Política.

RESUMO

Este artigo se propõe a analisar o debate sobre a política espacial e a estratégia espacial de modo geral, a partir de obras de autores selecionados que abordam também o uso militar dos recursos espaciais, além da importância do comando do espaço para as decisões estratégicas e da analogia do poder espacial com poder marítimo e aéreo. A partir disso, pretende-se analisar brevemente o pensamento dos autores que abordam essa questão na República da Índia, verificando-se como compreendem o desenvolvimento dessas capacidades dentro do país, em um contexto regional de tensões e disputas com países como China e Paquistão, como exemplos.

Palavras-chave: Estratégia. Espaço. Índia. Política.

1 INTRODUCTION

The interest in the uses of outer space¹ rose with the end of World War II, when the great powers of the time used the lessons provided by the conflict to develop systems and technologies (SHEEHAN, 2007). However, only with the so-called Space Race, in the context of the Cold War, the dispute between the United States and the Soviet Union drew new paths between the great powers, acquiring a classic realistic bias to explain spatial competition (SHEEHAN, 2007, p.7). In this perspective, the space race is explained by the competition for power between the two great powers. A space program could contribute to confirm or suggest wide-ranging capabilities, such as long-range missiles and technological expertise (SHEEHAN,

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The acronyms and abbreviations contained in this article correspond to the ones used in the original article in Portuguese.

¹ Outer space is considered as any space outside the Earth's atmosphere above 100 km from the surface of the sea (Karman Line). At this point, the atmosphere is very rarefied to the point that an aircraft can not sustain itself without reaching a speed higher than the orbital velocity (CEPIK, 2015, p.10).

2007, p. 8). Then, the importance of outer space has increased for the international dynamics, in addition to the development of important technologies used by modern civilization. The era of space, thus, is the era of global politics, with the connectivity and diffusion of information provided from space-dependent resources, making the international political system truly planetary (SHEEHAN, 2007).

In this context, the Republic of India began to increase investment in its space research in 1962, shortly after the launch of the first artificial satellite, Sputnik I, by the Soviet Union in 1957. Since then, Indians have developed capabilities with the aim of bringing national development to the most remote corners of the country. Thus, scientists and rulers, such as the creator of the Indian Space Research Organization (ISRO), Vikram Sarabhai, and the then Prime Minister, Jawaharlal Nehru, began advocating investment and technology development linked to space assets. Noteworthy are then some Indian feats in the space area. In 1980, India became the 6th (sixth) country to launch – after Soviet Union, the United States, France, Japan and China –, a satellite using its own launch vehicle (ELKIN, FREDERICKS, 1983; SHEEHAN, 2007). From 1982 on, it launched the series of satellites that make up the Indian Regional Navigation Satellite System (IRNSS), similar to the Global Positioning System (GPS) of the United States, but with regional reach. It accomplished, in April 2016, the launch of the seventh and last satellite of this constellation, already in operation (INDIAN SPACE RESEARCH ORGANIZATION, 2016b).

According to data from The Space Report (SPACE FOUNDATION, 2015), India ranks among the 10 largest space programs in the world², if one analyzes the government's space budget. The country is in the seventh position, with an estimated 1.205 billion dollars spent in 2014. Its relevance is remarkable, especially considering that the country has 36 (thirty-six) orbiting satellites currently operating, and three launch vehicles – the newest, GSLV Mk-III, still in test phase, but with the possibility of doubling the useful load taken to outer space (UNION OF CONCERNED SCIENTISTS, 2016; INDIAN SPACE RESEARCH ORGANIZATION, 2016a). Other data confirming the strength of the Indian space program refer to satellites for military use. From the data of The Military Balance 2016 (INTERNATIONAL INSTITUTE FOR STRATEGIC STUDIES, 2015, p. 251), the country

has six satellites for military use, with three from GSAT series communications and three from Intelligence, Surveillance and Reconnaissance (ISR), one of which is the Cartosat 2A series and two of the RISAT series.

From this context, then, this paper proposes to analyze the debate on politics and space strategy in general, addressing the military use of space resources, such as satellite launchers – which can be adapted to launching missiles, as well as the importance from command of space to strategic decisions and analogy of space power with maritime and air power. Subsequently, we intend to analyze the thinking of the authors who approach this question in the Republic of India, and to verify how they understand the development of these capacities.

To guide the work, we start with two questions:

- 1) How did the development of strategic spatial thinking take place?
- 2) How is strategic spatial thinking developed in India?

The objectives of the paper are analyzing the works of the authors that approach strategy and space politics, understanding the debate for the formulation of a theory of space power and analyzing the formulation of an Indian strategy for outer space.

As a justification, the context of the Cold War, starting in the 1960s, and the advent of outer space as a determining arena for surveillance, maintenance of telecommunications and routes of command and control are highlighted, intensifying the process of digitalization and the use of nuclear resources (CEPIK, 2015). In the context of the Gulf War of 1990/91, we stress the continued expansion of the importance of space capabilities in conventional warfare operations and the flow of information at the global level, legitimizing the operational value of space systems.

The methodology of the work consists of a review of selected literature on space strategy, from authors who study outer space, namely: Klein (2006), Moltz (2010), and Harding (2013), in addition to the literature on Indian space strategy, from the works of Klein (2012), Sachdeva (2013), Neves Júnior (2015) and Lele (2016). The paper is structured as follows: the second section presents the general literature on space policy and strategy; the third section, more specifically, covers the strategic spatial thinking of the authors who study the Republic of India. Finally, in the conclusion, we seek to retake the review made and to analyze the similarities and differences

² The 10 largest space programs in the world, according to the governmental space budget, are: 1) United States, 2) European Space Agency, 3) Russia, 4) China, 5) Japan, 6) France, 7) India, 8) Germany, 9) South Korea and 10) Canada (SPACE FOUNDATION, 2015, p. 22).

between general and Indian thinking about the role of space policy in international dynamics.

2 SPACE POLICY AND STRATEGY

The development of the space strategy was based on the need to understand a new working environment, mainly after the digitalization and the use of the space for C4ISR capabilities – command, control, communications, computers, intelligence, surveillance and recognition (ÁVILA; CEPIK; MARTINS, 2009). On the theme developed here, it is important to highlight a caveat about the authors' approach to the formulation of a spatial strategy. The authors focus on Western cases, such as the United States, since the US space program has been and is currently the one with the most advanced space technology and greater access to data and information. Thus, one cannot deny its influence to the development of these technologies and the consequent application and interpretation in other countries, especially from the beginning of the First Space Age, in 1957 (CEPIK, 2015, p.19).

In his book **Space warfare: strategy, principles and policy**, John J. Klein notes that operations in space have more in common with the sea and the air than one imagines. The author then addresses Air Marshall Giulio Douhet's theory of airpower, which says that airplanes would be tactical and strategic solutions, and that the wars of the future would be won by air (KLEIN, 2006, p.14). Even if Douhet recognized the need for cooperation among land, naval and air forces, he emphasized that they should operate independently, highlighting that airpower could achieve victory without joint efforts of land and naval power (KLEIN, 2006, p. 14). The overvaluation of airpower was visible in his theory, elevating it to a degree of importance far superior to the other dimensions. In 1986, John A. Warden developed the contemporary theory of airpower, in which he reaffirms the dominance of this power over other forces, with a unique ability to achieve victory with maximum effectiveness and minimum cost (KLEIN, 2006, p. 14). In addition, Warden uses the Clausewitzian concept of center of gravity, in which he imagines society with a series of concentric rings in the center of which lies the enemy's leadership. Because of the ability of these leaders in the decision-making process during the war, military efforts should be directed to that center, and airpower is the ideal for that mission (KLEIN, 2006, p. 14).

Klein, for the analogy with the sea, cites Alfred Mahan's theory of naval power, which shows Jomini's strong influence on the main points identified for war

at sea: the concentration of forces; a central position in relation to enemy forces; operating from inside lines; and having a good line of communication (KLEIN, 2006, p.19). Like Jomini, Mahan believed that wars were won in battles, with concentration of forces as the most important principle: a central position in which the inner lines and communication lines functioned to ensure greater concentration (KLEIN, 2006, p.19). In addition, Klein explains the strategic principles of Sir Julian Corbett's command of the sea as a stepping stone for the formulation of principles related to outer space. Corbett's strategic theory and principles cover the support that military operations must give to political and national goals. He believed that offensive and defensive strategies were complementary and that access to and use of unearthly communications lines are the most important factor in maritime operations, and consequently, such access should be protected (KLEIN, 2006, 22). It was Corbett who created the concept of sea command, with which Klein makes an analogy to space, since this concept clearly expresses the need to control communications. As discussed below, space command is a restructured approach to sea command.

It should be noted that Klein uses authors with a Clausewitzian bias, but also observes, although not deeply, the lessons of other strategists, such as Sun Tzu, Jomini and Mao Tse-tung, to show how space strategy and principles associated with war space can be driven to predict concerns, develop ideas and suggest policies. Klein emphasizes that, in spite of previous efforts to develop a theory and strategy on space warfare, it has been observed that such a strategic framework – comprising the essence of space operations and associating national interests – still needs to be formulated (KLEIN, 2006, p. 3). According to the author, this failure is a consequence of the various divergent and conflicting ideas about space strategy, since they only offer a range of competing strategies and points of view. One theory attempts to make sense of what would be incomprehensible and gives the rules of the game by which actions become intelligible (KLEIN, 2006, p.4). The author then parts from history to come up with a space strategy. He adapts Corbett's thesis by saying that space is connected to national power and that space operations are interdependent with other operating environments. He also emphasizes that the inherent value of space lies in the utility and access that the unearthly lines of communication provide.

The main point of Klein's work is the characterization of the concept of space command. According to the author,

Space Command comprises a country's ability to secure access and use unearthy lines of communication when necessary to support instruments of national power such as diplomacy, economics, information and military means. It also includes the ability to prevent or deny access to and use of the enemy's unearthy communications lines, or to minimize the more severe consequences an adversary can provide. (KLEIN, 2016, p. 60, our translation).

From this definition, Klein delimits how the command of space can be exercised by a nation, namely: command by presence, coercion and force. The command for presence gives a country some respect, gaining some level of influence in shaping international treaties and regulations. The command of space by coercion is employed by one or more non-offensive measures (diplomacy, economics, information) in an attempt to change another view or position on a subject – a prerequisite for exercising coercive command is to gain presence within the same area of activity in which coercion will be attempted. Finally, command by force is used both to win and to command space, and it covers the use of force in operations or resources – an obvious use of hostile actions (KLEIN, 2006, p. 61-67).

Klein's work shows that, paradoxically, while space operations are more similar to air operations at the tactical warfare level, space operations are more similar to naval operations at the strategic level (KLEIN, 2006, p. 154). In this way, the author concludes that the air and naval models fail to grasp the true breadth of space operations and strategy (KLEIN, 2006, p. 3). Thus, it shows that space is a means of supporting other military services, demanding their own principles and rationality.

Therefore, the paper by James Clay Moltz, **Space and strategy: a conceptual versus policy analysis** (MOLTZ, 2010). In it, the author proposes to focus on the definition of strategy as a plan to organize and develop resources in order to reach objectives that consider known and expected cause-and-effect relationships (MOLTZ, 2010, p. 116). Thus, the author first addresses the development of an American nuclear strategy from 1945 to 1991, explaining what lessons can be learned to apply to space. He highlights that both the nuclear and space fields involve the development and application of advanced and costly technologies, dealing with hypothetical events such as nuclear war and space war, while involving national programs of great prestige (MOLTZ, 2010, p. 117). After explaining how the nuclear strategy was developed in the Cold War period, Moltz shows that nuclear strategy brought some inconsistencies between theory and reality, as it can be seen in the example in which increasing nuclear

arsenal for mass retaliation has made the United States less secure – and that these results should be avoided in space (MOLTZ, 2010, p. 119).

Then, it specifically addresses the attempt to formulate a United States space strategy, since 1958, with the National Space Policies, to the present day (MOLTZ, 2010, p. 121). In summary, the author approaches each government and its negotiations to create a strategic model, concluding that the country has never reached a complete space strategy. Moltz states that what happened in the country was a range of objectives and priorities compiled to fit into national policies, presenting contradictions between peaceful purposes and military plans, goals and warnings (MOLTZ, 2010, p. 125). Recent efforts have shown that the United States has set space budgets, cleared NASA's mission, promoted missile defenses, and banned space weapons, but they have not yet been able to develop a coherent and comprehensive space strategy (MOLTZ, 2010, p. 130).

Moltz still presents the prerequisites he deems necessary for the creation of a space strategy. In the first place, it is necessary to identify a goal that is widely understood and accepted, linking American national values to commercial, political and security values (MOLTZ, 2010, p. 130). It would also include dominance, engagement, development, exploitation, colonization and protection of outer space. Secondly, a space strategy should consider the reaction of other space actors, since the United States is the leader of space power today, and other countries try to compare their efforts (MOLTZ, 2010, p. 131). Thirdly, financial resources should be found to finance any spatial strategies, since the development of space defense systems is a national advantage (MOLTZ, 2010, p. 132). Finally, the fourth prerequisite refers to environmental sustainability, since space resources are limited and include critical areas such as the distribution of orbits that have increased demand. The belt of the geostationary orbit will face limitations, in addition to space debris becoming one more issue to be considered (MOLTZ, 2010, p. 133). In this way, Moltz states that it will be necessary to manage these requirements in order to arrive at an effective spatial strategy, especially to deal with the increased use of these resources (MOLTZ, 2010, p. 133). For strategic development, there should be serious studies on these challenges.

Finally, the publication of Robert C. Harding, **Space policy in developing countries: the search for security and development on the final frontier** (HARDING, 2013), addresses the evolution of space policies. His book treats space power as a source of national power, dealing with the modern state and evolution of national space policies. The author focuses

on emerging space actors (EMSA) such as China, India, Japan, South Korea and Israel, which are expanding their space assets to ensure they can take advantage of national security and commercial advantages (HARDING, 2013, p. 6). Similarly, Harding divides space actors into three subdivisions: first-tier space actors, BRICs³ (Brazil, Russia, India and China), second-tier space actors and third-tier space actors. The latter two refer to the smaller but no less space enthusiast countries, which comprise the majority of the space actors.

What is outstanding from Harding's book is his approach to the evolution of space programs and how they developed their strategies. The author then shows that these technologies present a pattern in which, in developed and developing countries, the decision to invest in a national space policy has shown not only the desire to achieve technological advances, but also the supply of needs of the state (HARDING, 2013, p.194). Another point highlighted by the author is that not every state with space capabilities seeks a purely security orientation, since the actors seek to understand how other countries position themselves in the international system at a given time (HARDING, 2013, p. 194). As developing countries emerged from the shadows of Cold War hegemony, many adopted their own policies – demonstrating national capacity, seeking international prestige, and realizing nationalism are some choices of these states capable of facing financial, technological and political challenges (HARDING, 2013, p. 195). Harding concludes that the reasons varied with circumstances, but when space became a political imperative, countries with emerging space programs shared strategic projects and sought spatial budgets (HARDING, 2013, p. 195).

Then, it was possible to understand what the selected authors present about the importance of developing a strategy for outer space, given the growing relevance of this environment to the international context. It is latent the need for coordination of space actors, whether they are countries or organizations, mainly due to the peculiarities of the environment and the need to share resources. Next, it is necessary to analyze the Indian case and how the selected authors see the country's space strategy.

3 POLITICS AND INDIAN SPACE STRATEGIC THOUGHT

India, as already mentioned, is on the list of the world's top ten space programs. In order to understand the recent advances and the militarization of its

space program, some authors' thoughts about the rationality of the Indian program is analyzed. John J. Klein, in his paper **Space strategy considerations for space medium powers**, presents a comparison between superpower strategies and medium-power strategies (KLEIN, 2012). According to the author, the main purpose of these medium powers would be to ensure access to and use of the unearthly lines of communication to support national goals during times of peace and war (KLEIN, 2012, p. 110). Only in relation to the Indian propositions, Klein highlights India's most recent strategic vision in this environment, called **Space Vision India 2025**. This view is aligned with the idea of establishing greater presence in space. According to Klein (2012), this vision includes pragmatic and ambitious programs such as: satellite-based communication and navigation systems for connectivity, mobile services and security needs; planetary exploration; development of a space elevator; and manned spaceflight. Some space specialists have speculated that "India seems to be challenging the regional leader, China, in an unrecognized Asian space race" (KLEIN, 2012, 115). Like China, India is expanding its presence in civilian and military space capabilities, including those related to anti-missile defense and anti-satellite weapons, under the assumption that countries will acquire space weapons or have already done so (KLEIN, 2012, p. 115). Another important point that Klein points out about Indian perspectives is that even though the country does not have an anti-satellite program, it can modify its missile defense program for military uses in times of crisis if a threat arises (KLEIN, 2012, 118). The author concludes, then, that,

[...] as the average powers continue to develop military space capabilities, their respective space strategies will involve the protection of national interests, as well as security concerns. In the case of India and Japan, for example, this may be especially true, given that China, a space superpower, is seeking military space capabilities, including antisatellite systems. (KLEIN, 2012, p.124, our translation).

As to G.S. Sachdeva, in his chapter **Space policy and strategy of India**, a part of the book organized by Eligar Sadeh, **Space Strategy in the 21st Century: Theory and Policy**, presents a brief history of the development of the Indian space program, highlighting some topics such as technological resources and intellectual and economic constraints, official government discourses, future vision, space

³ Harding (2013) does not include, in his analysis, South Africa in the term "BRICs", using the original classification of the Goldman Sachs report of 2001. The author classifies South Africa as a "second level space actor". For more details, see Harding (2013, p. 79; 123).

technology development and new strategic mandates, closing with the international implications and relations of India with China, Russia, the United States and Asian competitors (SACHDEVA, 2013). It should be noted that the author states that India does not yet have a long-term national space policy in the field of space strategy, with a lack of strategic objectives to identify flaws between policy and implementation (SACHDEVA, 2013, 318). The author highlights the orientation of socioeconomic development as a strategic objective that still persists in his space program.

In this sense, the context of the development of space technology in the country denotes the operational gain and the experience in launches, besides remote sensing and the geospatial experience (SACHDEVA, 2013, p. 318). In relation to China, the author points out that India faces a competitive environment; on Russia, a cooperative relationship; and, in the case of the United States, the new strategic level of nuclear cooperation, which is beginning to encourage both countries to cooperate in space (SACHDEVA, 2013, page 318).

According to Neves Júnior (2015), space command is one of the bases of Indian military modernization, in which the new Indian way of warfare depends, ultimately, on its ability to integrate its military assets into a network. This network, then, is only possible through the command from space (NEVES JÚNIOR, 2015, p. 99). According to the author, the Indian space program has some very specific objectives, and the search for recognition in the race for space command stands out becoming a power, since the need to have a system of satellites and technologies space to implement their network and consolidate a new way of making war is latent. In addition, he points out the need to continue economic development and the increase of military potential from outer space (NEVES JÚNIOR, 2015, p. 98).

Neves Júnior (2015) also shows the differences in the space program of India from the others: less quantity and quality, but adequate to current capacities, dependence on civil/economic uses, in order to enable its operation and cooperation to transfer technology as a condition, not as options. For these reasons, assets related to space warfare are still underdeveloped (NEVES JÚNIOR, 2015, p. 99). The author further explores the development of the Indian program and the doctrine of use of space assets, concluding that the country's space devices are used for defensive

purposes of guidance, communication, imaging and regional scope, mainly related to the country's Air Force (NEVES JÚNIOR, 2015, p.159).

Finally, Ajey Lele formulated a proposal for India's space security, launched in April 2016, by the think-tank called Institute for Defense Studies and Analyzes (IDSA). The author believes that India's belief that space technology is used only for socio-economic development needs to evolve. Lele notes the need to formulate a cohesive national policy, in order to represent interests in space and to effectively address emerging and already existing challenges (LELE, 2016).

According to the author, satellites have been used for many purposes, from meteorology, navigation and Internet, to financial administration and scientific research more recently, highlighting their dual use for safety issues (LELE, 2016). The use of outer space to support military functions such as reconnaissance, communications and navigation has received global acceptance, as long as its use does not directly contravene the existing international regime⁴ (LELE, 2016). The author then proposes these six points to be developed by India in its national security policy regarding the use of space assets (LELE, 2016, p. 3-6).

1) Developing an institutional framework to implement space security policy: the author proposes the creation of a National Space Security Authority, supported by the Ministry of Defense, in addition to a Space Security Center to coordinate activities with qualified personnel, scientists, technologists, lawyers and diplomats.

2) Establishing a Space Command: Army, Navy, Air Force and other services like Coast Guard need to increase their support in satellites for intelligence, communications, navigation and operation of weapons systems – a command to administer these military aspects of satellite technology.

3) Improving the capacities of space situational awareness: developing a network of alert radars to gather intelligence, such as reducing the risks of space junk, and ensuring the development of a global program.

4) Legal Architecture: lawyers and diplomats play an important role in developing the space security agenda. A legal regime would demonstrate the needs and obligations of space treaties.

5) Strategic Technologies: innovations need to be encouraged by defense agencies and to increase their engagement. The country is against space armament, but it needs to stay prepared.

⁴For more information on international laws regulating outer space, please visit the website of the United Nations Office for Outer Space Affairs: <<http://www.unoosa.org/oosa/documents-and-resolutions>>. Accessed on: Aug. 13, 2016.

6) Counter-space capabilities: Military dependence on space makes resources more vulnerable to attack. Thus, it needs to test anti-satellite weapons for demonstration of dissuasion, in addition to an antisatellite kinetic energy program.

Lele, then, concludes that these points present emerging challenges and that the context of global spatial change is highly dynamic. The Indian Space Research Organization competes with the best in the world and remains as the center of formulation and implementation of India's space security policy. Thus, the author reveals that ISRO would be the point of horizontal and vertical interaction between the various departments and agencies proposed for the creation of a national space security architecture (LELE, 2016, p. 6).

4 CONCLUSION

Based on the referenced bibliography, it was possible to verify that, despite being one of the countries with most initiatives related to space assets, India needs to define specific objectives, to direct initiatives and to coordinate and centralize efforts. It is necessary, then, to verify Ajey Lele's proposal and to deepen it, since the author only presents what he believes is important to be developed. The validity of the author's proposal, which is extremely relevant to the debate on the country's policy and space strategy, is not denied here. Thus, it is convenient to continue thinking about the needs of the country and how space resources can help to supply them.

It can also be verified that it is not only India that needs a better definition of objectives. As discussed by

Moltz and Klein, the United States also does not have a clear and cohesive space strategy. In this context, the difficulty of understanding and exploring the space environment, its demands and advantages, may bring a range of points to be considered, mainly because they are resources that require high monetary investments – which is extremely more sensible in India than in the United States.

In addition, it can be seen that the relation of space resources and military application is clearly interconnected, since communications, to cite one example, are highly dependent on these assets. What is noticeable about India is the greatest concern with the security of these resources and the protection of information, given that their space program was developed – albeit in the official discourse – initially to meet their demands for socioeconomic development and depended, until recently, on foreign technology transference.

Finally, it is essential to emphasize that the research agenda on strategy and space policy still needs to be deepened. The continuity of research in this subject becomes crucial when perceiving the necessity and the influence of the space resources, as much in the day-to-day of the population as in the applicability for security and defense purposes. In the Indian case, the decision-makers demonstrate high expertise, as the country faces difficulties in several areas and shows great progress in research and application of its resources. Outer space, like cybernetics, is already added to the air, sea and land environments, and studying it will only help connect existing resources even more.

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