

# TO INFINITY AND BEYOND! AEB AND THE CASE OF GEOSTATIONARY SATELLITE IN THE LIGHT OF THE SPACE STRATEGIC SECTOR<sup>1</sup>

AO INFINITO E ALÉM! AEB E O CASO DO SATÉLITE GEOESTACIONÁRIO À LUZ DO SETOR ESTRATÉGICO ESPACIAL

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## ABSTRACT

*With the Cold War enclosures, the predictability of current international relations since World War II is drastically reduced, triggering changes in space programs around the world. Brazil is included in that list. In this sense, the following research problem rises: does the military sector still have relevance in space activities at the beginning of the new millennium, specifically in Brazil, whose Space Agency is established with civil nature? This work starts from the following hypothesis: even with the end of the Cold War and the wider concept of security, the Armed Forces do not lose importance in Brazilian space activities. An example that supports this thesis is related to the civil-military building of the Geostationary Satellite Defense and Strategic Communications (SGDC). Thus, the main objective of this work is to qualitatively analyze the SGDC's design and the role of the Brazilian Space Agency (AEB) in the space strategic sector, the latter engendered by both National Strategy and Defense Policy.*

**Keywords:** Brazilian Space Agency. Space. Strategic Studies. Geostationary Satellite of Defense and Strategic Communications. Space strategic sector.

## RESUMO

*Com o fim da Guerra Fria, a previsibilidade das relações internacionais vigentes desde a Segunda Guerra Mundial é reduzida drasticamente, desencadeando transformações nos programas espaciais ao redor do mundo. E o Brasil não fica de fora dessa lista. Nesse sentido, consubstancia-se o seguinte problema de pesquisa: o setor militar ainda possui relevância nas atividades espaciais neste início de novo milênio, especificamente no Brasil, cuja agência espacial é criada com natureza civil? Parte-se da hipótese de que, mesmo com o fim da Guerra Fria e o alargamento do conceito de segurança, a caserna não perde relevo nas atividades espaciais brasileiras. Um exemplo que corrobora tal tese é a construção civil-militar do Satélite Geoestacionário de Defesa e Comunicações Estratégicas (SGDC). Assim, o objetivo principal deste trabalho é analisar, qualitativamente, o projeto do SGDC e o papel da Agência Espacial Brasileira à luz do Setor Estratégico Espacial, sendo este último engendrado pelas Política e Estratégia Nacionais de Defesa.*

**Palavras-chave:** Agência Espacial Brasileira. Espaço. Estudos Estratégicos. Satélite Geoestacionário de Defesa e Comunicações Estratégicas. Setor estratégico espacial.

<sup>1</sup> E.N.: To provide for easier understanding of the text a list of acronyms and abbreviations is attached to the last page of this article.

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## I INTRODUCTION

The Space Era started with the liftoff and orbital operation of the Sputnik I, the first artificial satellite launched by the former Soviet Union, in 1957 (AGÊNCIA..., 2012, p. 8). The impact of this event on the course of contemporary history was so great that in the United States of America (USA) it gave rise to the so-called "Sputnik moment". This introspection by the Americans was actually a critical analysis of the national research and education system as a whole, with the purpose of enabling the generation of baby boomers to bridge the scientific-technological gap between the US and the Soviet Union (CHACRA, 2011).

Since then, in parallel to other traditional dimensions<sup>3</sup>, Space<sup>4</sup> became the focus of strategic reasoning, linking it to the fear that the same rockets that had launched the Sputnik I could also be able to carry nuclear warheads. This was what day by day the strategists of the two antagonistic blocks had to think about during the Iron Curtain period.

With the end of the Cold War, a drastic decrease "[...] can be observed in the degree of previsibility of the international relations existing the Second World War came to an end" (BRASIL, 2012c, p. 17), triggering, among other changes, to a worldwide revision of space programs (BRASIL, 1994a). And it was no different in Brazil.

The Brazilian Space Program (PEB)<sup>5</sup>, developed by the Brazilian Space Agency (AEB), has been the target of ambitious projects, which appear to have helped to strengthen the civil-military relations in the Country. There are two main reasons why such closer ties are relevant to the objective of this paper. The first one is that they smoothed out any possible misunderstanding remaining from the military period. And, the second one has to do with certain drawbacks both the recently established AEB and its space program face to deal with issues like low budget, understaffing<sup>6</sup> and government cuts. Additionally, both the National Space Activity Development Agency (PNDAAE)<sup>7</sup> and the PEB itself let us glimpse at the perspective that the sought excellence and independence depend on alignment and ties between the public and private sectors. However, as it is a relatively new agency with limited institutional structure, the AEB lacks a know-how which, for now, just the government

- meaning the Brazilian Air Force (FAB) – can promptly provide.

It is from this point that the issue of an independent space development lead to the following question: which is the role the military component will play in the development of the Brazilian space endeavors at the dawn of this new millennium?

On this subject, this paper starts from the key premise that, even after the end of the Cold War and acceptance of a broader Security concept<sup>8</sup>, the Brazilian military sector<sup>9</sup> does not lose prominence with respect to the Space-related issues, in view of their expertise and significant influence on the development of strategic space activities and projects in the Country.

In order to support this point of view, this paper presents a qualitative analysis of the case study on the construction of the Defense and Strategic Communications Satellite (SGDC). Just like the Sputnik I, when its operation starts, this satellite will bring about critical benefits to both the civil and military fields of action. Notwithstanding, for this to come true, it must first reach space. And this is when the AEB enters the stage. Could the SGDC be the fuse that will trigger the long-expected Brazilian "Sputnik moment". This is what we will try to answer at the end of this paper.

Besides the Brazilian case, another method employed for this work was the analysis of primary sources, with special focus on legal and doctrine provisions about the space activity subject. For example, as to the Brazilian military scope of action, it must be noted that the key documents issued by the Ministry of Defense (MD) – the National Defense Policy (PND) and the National Defense Strategy (END) – refer to the space sector as one of the three strategic sectors of National Defense and Development. As to the civil realm, the current legislation contributes to an understanding of the role of space-related activities in the development of the Country. Therefore, the main focus of this paper is precisely this dialogue between those who wear uniforms and the civilians.

Thus, the general objective of this paper is to shed light on the position the SGDC and the role of the AEB in the light of the Space Strategic Sector. In other words, its purpose is to understand the role of a civil space agency in the development of an apparently strategic-military sector.

To this end, the following specific objectives were set: (i) understand the so-called Space Strategic Sector; and (ii) position the AEB within the scope of the PEB; and to analyze the civil-military construction of the SGDC.

As this rather procedural than a theoretical work, no theoretical affiliation is established to ground either the hypothesis or the analysis itself. Nonetheless, as this is a subject where discussions are centered on power

3 Sea, ground and air, encompassed by the Space. Cf. Brasil, 2012c, p. 24.

4 For standardization purposes the substantive Space is used in this work as synonymous to Outer Space or Deep Space, that is, to refer to Earth's external environment. Thus, its homographs are excluded.

5 "PEB" is a non official expression adopted to designate the National Program of Space Activities (PNAE). As the Brazilian Space Agency uses it (2012, p. 9) here both names were kept with the same meaning.

6 Just to give an idea of how serious the understaffing problem is, the first public examination for hiring sponsored by AEB was held in 2014, and it is expected that the new government employees will be officially appointed in 2015 (AGÊNCIA..., 2015).

7 AEB activities are guided by the PEB, which, on its turn, follows the guidelines issued by the PNDAAE.

8 Cf. BUZAN; WÆVER; WILDE, 1998, p. 1, 239; BRASIL, 2012c, p. 13.

9 Specifically to the Air Force and even more strictly to the FAB.

relations in the international system, a realistic view of the international relations is also approached, even if implicitly. Following this reasoning Space is seen as a basis for power increase (DOLMAN; COOPER, 2011), or as “a new frontier to be explored as part of an inevitable competition for power” (PFALTZGRAFF, 2011, p. 47).

It is our understanding that by engaging in a strategic analysis of the development of space-related activities in Brazil, this work is grounded, on one side on a guideline of the PEB itself that has to do with the promotion of a space culture (AGÊNCIA..., 2012) in Brazil, and on the other, on the fact that “[...] Defense should not be reserved solely for the military or the government” (BRASIL, 2012c, p. 7).

Last, this paper is broken down into four sections: the first one is this introduction; in the second the Space Strategic Sectors is approached in the light of the documents that govern the Brazilian National Defense; the third section discusses the role of the AEB and of the construction of the SGDC; and the final considerations are presented in the fourth section. An Appendix containing the different acronyms and abbreviations is attached to the last segment of this text.

## 2 THE STRATEGIC SPACE SECTOR

For a proper understanding of the role played by the military in the development of the Brazilian civilian space activities it is critical to fully grasp the concept underlying the *Space Strategic Sector*. To this end, it is of utmost importance to look in to it in the light of the END, as improved understanding its content can only be achieved by a previous analysis of both the PND and the PEB.

One of the priority actions of the PEB is its alignment to the other public policies enforced in the Country (AGÊNCIA..., 2012). With respect to this aspect it is not rare to see a strategic alignment between the PEB and the PEB the “[...] most important instruments that guide Brazilian Defense[...]” (BRASIL, 2012c, p. 7). Jointly with the PND and the END, the PEB is seen as one of the “[...] strategic and future defining sectors [...]” for Brazil (BRASIL, 2012d, p. 13).

The new versions of the PND<sup>10</sup> and the END were simultaneously issued in 2012, as well as the first edition of the National Defense White Book (LBDN). These three documents that direct the National Defense evidence the concern and the wish to develop the Brazilian space sector, as the Country has much to lose from the existing gap.

In few words, the PND

establishes National Defense objectives and provides guidance to the [Brazilian] State on what should be done to achieve them. On its turn, the END

determines how the directives of the [National Defense] Policy should be enforced Policy (BRASIL, 2012c, p. 7).

In even more specific terms, by essentially focusing on external threats, the PND, sets out the National Security and Defense concept and analyzes the international and the domestic scenarios for a clear statement of Brazil's National Defense Objectives (BRASIL, 2012c). As discussed in the following sections, when understood in view of the ultimate objective of national development, the concepts of Security and Defense are critical to a clear understanding of the role of the FAB in the subject matters related to space issues. Seen from this view point, the PND is a document that provides guidance both to the military and the civilian sectors, as it aims at the establishment of a National Defense Culture - or, quoting the Ministry of Defense, (BRASIL, 2012c, p. 31, 152), of a “defense mindset” – among all Brazilians and across all areas of society.

The prospective analyses of the possible external threats to Brazil, had a lot to said about future conflicts, on whose seeds the classical geopolitical issues still exist, as for example, the natural resources and, especially, drinking water (AS GUERRAS..., 2014). Yet, by remarking that (BRASIL, 2012c, p. 17), “[...] disputes may be fuelled [...] for airspace mastery”, the Ministry of Defense raises the space sector to the “strategic” category, that is, as indispensable to national development and sovereignty (BRASIL, 2012c, p. 19, 32). As noted, the Federal Administration - at least theoretically - views space technology, jointly with cyber and nuclear technologies, as a strategic imperative in need of sources of investment both in the civil and the military areas. This civil-military aura, which was already born with the Space Strategic Sector, is translated into some of the joint projects of the AEB and the FAB, as in the case of the SGDC, that will be analyzed in the following section.

According to the Ministry of Defense (BRASIL, 2012c, p. 35), Brazil must look for uninterrupted interaction between the PND and the other central government policies in order to reinforce its *strategic structures* - as the critical infrastructures were called - aiming at National Defense, with emphasis, for example, on the communications infrastructure. In other words, the communications infrastructure referred to by the PND is intended to enable secure communications of the Armed Forces and the other civilian agencies responsible for preserving the national sovereignty. It is also emphasized that this “uninterrupted interaction”, and overlooked by the PND, finds a new interlocutor in the National Science, Technology and Innovation Strategy (ENCTI). For example, about Brazilian space endeavors, the ENCTI recognizes it as one of its *key strategies associated to*

encouragement to research, development and innovation in the nuclear, **airspace** and cyber defense

<sup>10</sup> The other two versions date from 1996 and 2005, when the PND was called National Defense Policy (PDN).

fields, consistently with the **National Defense Strategy**, enabling an integration of programs, and **seeking increased synergy between the military and civil research institutes** and universities (BRASIL, 2012d, p. 65, text highlighted by the author).

On its turn, the END targets an upgrade of the national Defense structure based on three structuring axes: (i) reorganization and reorientation of the Armed Forces (ii) restructuring of the Defense Industrial Basis (BID); and (iii) Design of the policy to be enforced for the composition of Army, Navy And Air Force personnel (BRASIL, 2012c, p. 42).

The main assumption underlying the END is that the entire Brazilian society must consider and implement projects related to the development of National Defense, which is associated to the National Development itself. In other words, the END seeks to disseminate a Defense culture in Brazil required prompt Brazilian society itself - and not just the military - to strategically consider the paths to be followed by the Country. And, more than that, in general terms the END aims at clarifying that despite its status as a pacific country, Brazil (BRASIL, 2012c, p. 44) needs to be prepared to defend itself from external threats whenever such threats may appear. A preventive way of achieving this goal is through strategic actions and projects, which necessarily includes the development of space activities, focusing, above all, on national territory monitoring and denial. As this paper will discuss later on, the SGDC represents the embodiment of this call for civil and military efforts towards defense of National Objectives.

Both the END and the PND also refer to the nuclear, cybernetics and space sectors as strategic areas for National Defense and Development (BRASIL, 2012c, p. 93-97; SOUZA, 2011). "By their own nature, these three sectors [...] transcend the divide between[...] the civil and military scopes of action" (TRÊS..., 2012, p. 6; BRASIL, 2012c, p. 49). These are, therefore, interdependent sectors. This is proved by the fact that by combining the cybernetics and space sectors,

[...] **the capacity to look at our own country ceases to depend on foreign technology** and the three Forces being networked, with inputs supplied also by **monitoring also from space** (TRÊS..., 2012, p. 6; BRASIL, 2012c, p. 49, text highlighted by the author).

As previously mentioned, the END is anchored on three *structuring* axes. Bearing in mind that the first specific objective of this paper is to position the Space Strategic Sector in the light of the PND and the END –, the analysis will just focus on the first structuring axis, that is, the reorganization and reorientation of the Brazilian Armed Forces.

The END sets out specific targets and objective for each specific force. For example, the END provides

that the Brazilian Army must act on the modernization of its brigade modules, which [...] requires a broad spectrum of technological resources, starting from the least sophisticated ones [...], *up to state-of-the-art communications between ground operations and space monitoring* (BRASIL, 2012c, p. 77).

This is the first indication that the Geostationary Satellite must not serve only the FAB purposes but equally those of the other Forces, reinforcing the interdependent nature of the three Strategic Sectors. However, this analysis is even more centered on the END provisions with regard to the FAB, once the Air Force is responsible for the Space Strategic Sector<sup>11</sup>.

Moreover, in its National Strategy the Ministry of Defense (BRASIL, 2012c, p. 85-91) specifies four *strategic objectives and three strategic guidelines* for the FAB. Just the first objective and the third guideline are relevant to the purposes of this Section, namely: (i) prioritize aerial vigilance; and (ii) integrate of space activities into their operations. Based on these two objectives, once again, the civil-military relationship can be seen as concurrently guiding the Brazilian space development. So, if the integration of such activities will be integrated in the FAB, this is required because *other external agencies* are also expected to act, and there is nothing more reasonable than having a synergic participation by the national agency in charge of handling the Space issues.

As to the first strategic objective, Space, the END sees it as a means - side by side with the sea, ground and aerial means - through which the Country will be able to engage in aerial vigilance over the national territory and its jurisdictional waters (BRASIL, 2012c, p. 85). In other words, the FAB needs "[...] **to rely on its own systems and platforms to [be able to] monitor the national territory**" (BRASIL, 2012c, p. 85, text highlighted by the author ). This is where the SGDC, among others, enters the stage, bearing in mind that, without a wholly Brazilian geostationary satellite, effective surveillance is practically impossible, either by means of visual or voice data. Besides satellites, the END also foresees other forms of monitoring, as for example, the satellite launching vehicle (SLVs) and the intelligence aircraft (TRÊS..., 2012). Together, these strategic devices form a layered monitoring complex named Brazilian Airspace Defense (SISDABRA), whose central agency is the Brazilian Airspace Defense Command (COMDABRA) (BRASIL, 2012c, p. 86) and whose purpose is "[...] to ensure the exercise of sovereignty in the Brazilian air space" (BRASIL, 1980). The implementation of the SISDABRA will require the Country to engage in a continuous search for national independence from foreign positioning systems, such as the Global Positioning System (GPS) (BRASIL, 2012c). Therefore, once in operation the SGDC must be part of the SISDABRA.

As to the third strategic guideline the END

<sup>11</sup> Even if this link, although logical, does not appear in the first two versions of the END.

says that the strategic tasks assigned to the FAB depend inexorably on space monitoring. In this sense, the implementation of SLVs

[...] will be a far reaching tool, not just to support the space programs, but also in the development of the national missile design and manufacturing technology (BRASIL, 2012c, p. 91).

Additionally, as the ADESG points out,

The Ministry of Defense has charged the Air Force Command with the coordination and the integration of the development of the programs and actions related to the space [strategic] sector within the scope of national Defense (TRÉS..., 2012, p. 7).

Based on the text of this Section, Figure 1 positions the Brazilian Space Strategic Sector, which is critical to for a clear understanding of Brazilian space-related activities as of the 21st century. Hence, the first specific objective of this paper has been achieved.

For the Space Strategic Sector to be actually able to exercise its *raison d'être*, those responsible for its implementation must assign priority to the development

Figure 1. The space strategic sector according to the END.



Caption:  
 BID -Defense Industrial Basis / FA - Armed Forces

Source: Adapted from Brasil (2012c) and Souza (2011).

of the following devices: SLVs; satellites and, above all, geostationary satellites; satellite-based communications, command and control (C&C) technologies; and, satellite-based geographic positioning (BRASIL, 2012c). Thus, by using Space as a tool at the service of National Defense, the communication satellites - such as the SGDC - “[...] will have a critical role to play in the feasibility of several functions in the command and control systems” (BRASIL, 2012c, p. 104).

Thus, the purpose of the next Section is to define the role of the AEB in the construction of the SGDC.

### 3 THE BRAZILIAN SPACE AGENCY (AEB) AND THE BRAZILIAN SPACE PROGRAM (PEB)

The Brazilian Constitution provides that the Federal Administration will have the prerogative of legislating on Space Law<sup>12</sup> (BRASIL, 1988). On grounds of this constitutional premise, on February 10, 1994, the AEB was established by the then President of the Republic Itamar Franco under Law 8.854.

This Agency came to replace the former Brazilian Commission for Space Activities (COBAE) that was also linked to the also extinct Joint Chiefs of Staff of the Armed Forces (EMFA) (BRASIL, 1994b). Different from its predecessor, the AEB was born as an independent civil federal agency (BRASIL, 1994b; 2003). Originally, it was linked to the Presidency of the Republic (BRASIL, 1994b), but less than ten years later (BRASIL, 2003), this link was transferred to the Ministry of Science, Technology and Innovation (MCTI), which among other duties is in charge of the national space policy. Thus, the AEB became one of the entities linked to the MCTI (BRASIL, 2006).

The general objective of the AEB is “[...] to promote the development of space activities of national interest” (BRASIL, 1994b; 2003). Therefore, these are not just any space activities<sup>13</sup>; but they must be strategic to the Country.

Despite being headquartered and domiciled in the Federal District (BRASIL, 2003, the AEB is best known for using the well known worldwide Alcântara Launching Center (CLA), which is linked to the Air Force Command in the State of Maranhão. The chief role of a launching base such as the CLA is to enable safe SLVs launching into Space.

A concept of strategic importance for us to have a national vehicle of this size - invariably for peaceful purposes (AGÊNCIA..., 2012) – is the VLS-I<sup>14</sup> project, one

<sup>12</sup> Going further on the realm of Law, “Space Law” is not a new subject in Brazil. An evidence is that it appears in the mandatory list of the traditional Decimal Classification of Law (CARVALHO, 2002, p. 10, 46).

<sup>13</sup> As for example those related to tourism or scientific experiments, often carried out by private sector American and Russian companies.

<sup>14</sup> The technical personnel who died in the Alcântara accident, in 2003, were actually working in this project (ACIDENTE..., 2003).

of the leading projects of the FAB, whose purpose is to reinforce the airspace BID (SILVA, 2012, p. 4-5). Because of the VLS-1 Project, once they share the same purpose, the civil-military relationship became even closer, namely: to enable a satellite, built with strategic purposes, to “park” on the Earth’s orbit and, from there supply safe military communications (BRASIL, 2012d, p. 16).

It should also be noted that the fact that the AEB is the core agency of the National System for the Development of Space Activities (SINDAE)<sup>15</sup> (BRASIL, 1994b; 1996; 2003), coordinating (BRASIL, 2012d) and leading it (AGÊNCIA..., 2012). This system sees the participation of military and private institutions in the development of Brazilian space-related activities as critical. The SINDAE comprises three types of bodies: central, sector and participating bodies (BRASIL, 1996). It is precisely in the composition of the second category - bodies responsible for sector coordination and enforcement of the actions included in the PEB – that a stronger dialogue between the civil and the military spheres can be observed, with the military sector represented, especially, by the Air Force Command Department of Aerospace Science and Technology (DCTA).

Figure 2 shows the composition of the SINDAE, where it can be seen that two liftoff centers - Alcântara and Barreira do Inferno – and the Aeronautics and Space Institute (IAE) are military agencies linked to the DCTA, whose activities related to the SINDAE are centered around a civil agency.

As shown in Figure 2, as the central agency of the SINDAE, the basic structure of the AEB includes a Higher Council, which is the deliberative body (BRASIL, 2003) in charge, among other attributions, of approving new participants for the SINDAE (BRASIL, 1996). Once

Figure 2. Composition of the SINDAE.



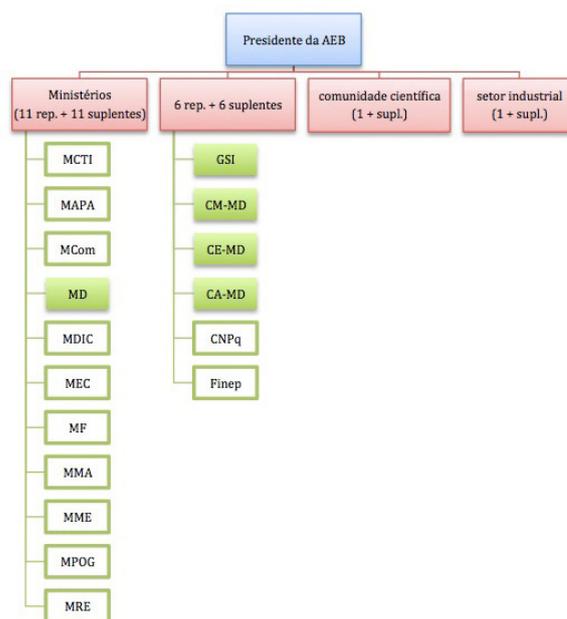
Source: Brazilian Space Agency ([2013?]).

15 In conformity with art. 4 of Law 8.854/94, the then President Fernando Henrique Cardoso established the Brazilian space system - under Decree 1953, dated July 10, 1996 -, whose purpose is to “[...] organize the implementation of the activities aimed at the space development of national interest” (BRASIL, 1996).

again, the civil-military relationship is evidenced here: notwithstanding the fact that the central body of the SINDAE is of civilian nature, the operation of the system itself depends on the partnership with the barracks. As shown in Figure 3, besides the MD and the Institutional Security Office of the Presidency of the Republic (GSI), the Navy, Army and Air Force Commands are also present in the SINDAE (BRASIL, 2003).

The Law establishing the AEB also provides on the update of the national policy on the development of space activities, the PNDAE that just came into being under Decree 1.332, on December 1994.

Figure 3. Composition of the Higher Council of the AEB.



Caption:  
MD - Ministry of Defense.  
GSI - Institutional Security Office of the Presidency of the Republic .  
CM-MD - Navy Command.  
CE-MD - Army Command.  
CA-MD - Air Force Command.

Source: Adapted with data from Brasil (2003).

The main purpose of the PNDAE is to establish targets and “[...] guidelines to direct the actions of the Brazilian government towards promotion of the development of space activities of national interest” (BRASIL, 1994a). The PNDAE encourages the establishment of public-private partnerships (PPP) and increased dialogue with the military sector. This is evidenced in the guidelines that direct the Plan. Three of these guidelines deal with qualification in strategic and dual use technologies, with emphasis on the “[...]space technology applications to solve problems such as [...] national territory defense and security” (BRASIL, 1994a, text highlighted by the author). Moreover, by emphasizing that the development of space activities definitely must promote national development (BRASIL, 1994a), the

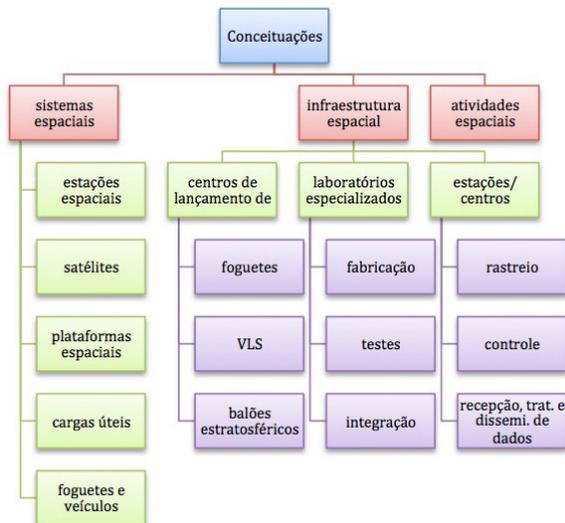
PND AE is clearly aligned to the precepts of both the PND and the END.

Nonetheless, among other, the PND AE establishes the following concepts that are critical to a clear understanding of the space activities in Brazil and, specifically, of the project of the first Brazilian geostationary satellite:

- **space systems:** [...] apparatuses designed for operation in space or to enable space operation of equipment intended to allow access to information or services;
- **infrastructure space infrastructure:** [...] set of facilities, systems or ground equipment, as well as the associated services, providing the necessary support to an effective operation and use of space systems; and
- **space activities:** [...] systematic efforts aimed at the development and operation of space systems, as well as the necessary and corresponding **infrastructure**[...] (BRASIL, 1994a, text highlighted by the author).

Figure 4 shows the concepts outlined in the PND AE, in order describe the position of the AEB towards the Space Strategic Sectors discussed in the previous Section.

Figure 4. Main concepts set out in the PND AE.



Caption:  
VLS - satellite launching vehicles

Source: Adapted with data from Brasil (1994a).

For example, using the rationale and the concepts presented in Figure 4, the SGDC can be defined as a *space system* of both a military (Defense) and civil (Communications) nature, to be launched on the Earth's orbit (Geostationary) through a *space infrastructure* – specific through a SLV launching center –, aiming at the development of (Strategic) *space activities* for the Brazilian State and Brazilian society.

By promoting the development of space systems and ground infrastructure, such as the SGDC, the PND AE actually targets the implementation of Brazilian space activities, which on their turn, can only come true by means of a space program specifically designed for the technological and geostrategic conditions prevailing in the Country. Accordingly, the PEB gathers proposals from the AEB, authorized by the Presidency of the Republic a (BRASIL, 1994a) aimed at the implementation of space activities in Brazil, whose horizon extends to the year 2021.

Just to have an idea of the impact the PEB intends to generate, it can be seen that until 2012, on average, Brazil invested R\$ 385 million per year in space activities (AGÊNCIA..., 2012); with the PEB, it is expected that in ten years R\$ 900 million per year will be invested (AGÊNCIA..., 2012), an almost 250% quantitative leap. Just the geostationary satellite is budgeted at R\$ 716 million (ORÇAMENTO..., 2012).

The fourth version of the PEB<sup>16</sup> was anticipated to 2012, as PEB designers understood that, at the time, the federal administration, had created unique opportunities for a revision of the national space program (RAUPP, 2012)<sup>17</sup>. Among these opportunities are the new guidelines of the Space Sector Fund and the construction of the SGDC, and it is precisely the latter that will be analyzed in the following Section.

## 4 THE CASE OF THE DEFENSE AND THE STRATEGIC COMMUNICATIONS GEOSTATIONARY SATELLITE (SGDC)

It was in 2001 that the Brazilian government decided to build its first geostationary satellite in order to “[...] meet the demand for official strategic (civil and military) communications [...]” and “[...] to make available effective means of guaranteeing national security” (AGÊNCIA..., 2012, p. 9).

As the name already evidences, this is a *geostationary* satellite, that is, its operational orbit - equatorial orbit navigation - is at an altitude of about 36,000 km, with a full rotation completed every 24 hours (ORÇAMENTO..., 2012). This type of satellite differs from the so-called low orbit satellites, with altitude ranging from 500 to 800 km de altitude (TRÊS..., 2012). According to France and Sellers (2011, p. 91), generally, for global coverage, the geostationary architectures employ three or more satellites jointly with ground infrastructure and cross-linking. In other words, three satellites are used with the purpose of mapping an area by triangulation. But

<sup>16</sup>The other three versions were issued in 1996, 1998 and 2005 (AGÊNCIA, 2012; COELHO, 2012).

<sup>17</sup>This statement is in line with the following statement from the Ministry of Science, Technology and Innovation (2012, p. 66): “the current stage of development of our country gives rise to demand for space applications, which just a more enterprising portfolio of projects than what we have now will be able to meet”.

this is not the case of the SGDC, as it is a single satellite at high altitude<sup>18</sup>, a given area can be mapped without requiring triangulation. This is one of the advantages of the Brazilian geostationary satellite.

In the PEB, the SGDC is said to be a structuring and mobilizing project (AGÊNCIA..., 2012; BRASIL, 2012d, p. 15, 119), whose implementation was originally planned for 2014 (BRASIL, 2012c; BRASIL, 2012d; ORÇAMENTO..., 2012), but this date was postponed to December 31 of 2016 (BRASIL, 2013). Besides coinciding with the first leads that the Federal Administration intended to make budget cuts as of 2015, it also shows the complexity of taking a satellite of this size to Space.

This satellite is justified considering that, in 2012, all of the more than 40 geostationary telecommunications satellites operating in Brazil were of foreign make. There is also the fact that in this period the Brazilian companies were just supplying "ground equipment, antennas for control stations and mobile TV services" (AGÊNCIA..., 2012, p. 9), and consumed "[...] telephone services, tracking, wideband internet and *military activities*" and "[...] satellite image generation" (ORÇAMENTO..., 2012, p. 63). Thus, the central government and the private sector were just developing means and not tools. For a country that for some time now has been wishing to become a leading player in international politics, Brazil lacks autonomous and independent development of state-of-the-art space components and technologies.

A major example of Brazilian external dependence in the space sector is the partnership with Ukraine for the establishment of the binational company Alcântara Cyclone Space (ACS) (BRASIL, 2012d). Based on this joint venture, this European country makes available SLVs adapted from old Soviet missiles, while as a counterpart, Brazil offers the Alcântara base, which is said to be the best place in the world for space launching (NOGUEIRA, 2015). Nonetheless, because of financial problems faced by both parties - increased by the Russian-Ukrainian conflict - and the meager cost-benefit of this partnership that dates from 2003, everything points to a possible termination of this project by the Brazilian Government (NERY; GIELOW, 2015). Thus, the independent development of a satellite with strategic features - added to the fact that international cooperation "[...] is not of a free exchange of valuable information nature" (BRASIL, 1994a)<sup>19</sup> - will allow Brazil not just to engage in the sovereign monitoring of its own territory, but also a new change of paradigm for the PEB projects.

In management terms, there are two agencies

involved in the SGDC project: The Steering Committee and the Executive Group. The first one is headed by the Ministry of Communications (MC) - that chairs the Committee- the Ministry of Defense and the Ministry of Science, Technology and Innovation (MCTI) (BRASIL, 2012a). On the other hand, the second one is formed by representatives of the following organizations: AEB, the National Space Research Institute (INPE)<sup>20</sup>, the MC, the MD and Telecomunicações Brasileiras S.A. (TELEBRAS)<sup>21</sup>.

Besides chairing the Executive Group, TELEBRAS, jointly with the MD, is in charge of managing the SGDC operation (BRASIL, 2012d, p. 67-68) after liftoff. As to the AEB - more specifically to the Satellite, Applications and Development Board<sup>22</sup> - it will be afforded the intellectual property rights deriving from transfer of satellite technology.

On the other hand, for the SGDC construction itself, a new company should be established by joining the efforts of Telebrás and Embraer Defesa e Segurança<sup>23</sup> (AGÊNCIA..., 2012; ORÇAMENTO..., 2012). In other words, the implementation of the geostationary project will be assigned to a civil state-owned company and to a private sector conglomerate focusing on Defense-related matters. Once again, the civil-military component appears in the search for a domestic solution for the problem posed by the reliance on foreign parties for space monitoring.

Figure 5 presents both project structure and the responsibilities assigned for the SGDC project.

As shown in Figure 5 the public/government sector - represented by TELEBRAS - is to hire a company to build the geostationary satellite. The rationale here is that the national BID should be driven and encouraged to manufacture defense products (PRODE)<sup>24</sup>. Actually, this is a necessary action, considering that, "since Embratel was privatized, the satellite services needed by the Armed Forces are supplied by private sector companies" (ORÇAMENTO..., 2012, p. 63). As already mentioned, solely foreign geostationary satellites are now in operation in the Country. In the event one of the home-States of these companies one day happens to become the enemy, Brazil will be totally deprived of information about its own territory. This is why there must be a domestic company

<sup>20</sup> According to Brasil (2006), the INPE "[...] shall be engaged in scientific researches, technological development, operational and human resources qualification in the fields of Space Atmosphere Science, Earth Observation, Weather Forecast and Climate Studies, Space Engineering and Technology".

<sup>21</sup> Linked to the MC, the "new" TELEBRAS is a private and public capital company reactivated in 2010, after its privatization in 1998.

<sup>22</sup> Cf. Brasil, 2003, art. 13, II.

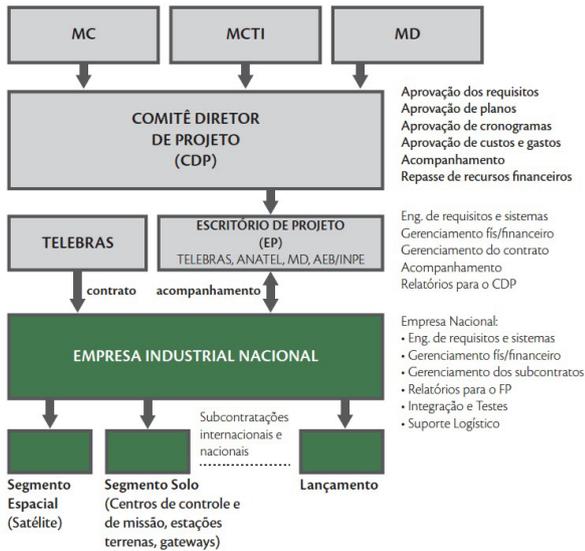
<sup>23</sup> Embraer Defesa e Segurança is an arm of Embraer S.A. - formerly named Empresa Brasileira de Aeronáutica S.A. -, privatized during the Itamar Franco administration. Today, Embraer is the "sole Brazilian company included in the defense industry ranking of the one hundred largest companies" (ORÇAMENTO..., 2012, p. 72).

<sup>24</sup> PRODE is "all and every asset, service, works or information, including armament, ammunitions, means of transportation and communication, uniforms and materials for individual and collective use employed in defense end activities, with the exception of those for administrative use (BRASIL, 2012a).

<sup>18</sup> Didactically speaking, at almost 35,500 km "[...] from the ground, object turns at the same speed as the Earth. Seen from the ground it seems immobile" (MISEREZ, 2013), that is, "stationary" on planetary orbit.

<sup>19</sup> Although the Brazilian Space Agency (2012) is planning for additional international cooperation projects, in association with the Itamaraty, after consulting the MCTI (BRASIL, 2003), whose purpose is cost and risk sharing and further development of the national space industry (BRASIL, 2012d, p. 12).

**Figure 5. Project structure and responsibilities assigned for the SGDC Program.**



Source: Brasil (2012d).

with capacity to develop, launch and operate this type of satellite.

Therefore, the establishment of this new company is directly linked to two priority actions and a strategic one referred to in the PEB, namely: “involve the industrial sector in all the stages of the development of space projects[...]”, “foster the establishment of integrating companies [...]” and “master the critical technologies [...]”<sup>25</sup> (AGÊNCIA..., 2012, p. 11).

Hence, the project of the SGDC, is fully justified when the territorial, technological, developmental and geopolitical characteristics of Brazil are taken into consideration, having in view that, currently, such characteristics are hindering the efforts to meet national needs in terms of telecommunications and border and sea coast surveillance, among others (BRASIL, 2012d). Thus, we have the latent fact that telecommunications applications give rise to significant impacts on the typical State actions and activities, most of all on those related to homeland defense and security (BRASIL, 2012d). With this in mind, different from the joint venture with Ukraine, the SGDC, for example, must be pragmatic in its results.

Considering the Space Strategic Sector, envisaged by the PND and the END, the stationary satellite project is consistent with the idea of autonomous development of sensitive space technologies<sup>26</sup>. Specifically, as of the issue of the second version of the END, in 2012, the FAB is expressly assigned the power-duty (BRASIL, 2012c) to

<sup>25</sup> Within the scope of the PEB, the so called critical technologies are broken down as follows: the leveling ones that are those already mastered by the countries and, therefore, easily obtain; those being developed by the nations and hard to access; and the disruptive ones, namely those coming from revolutionary technological innovations, to be pursued by the Brazilian space program (AGÊNCIA..., 2012, p. 12), under AEB coordination (BRASIL, 2012d).

<sup>26</sup> Cf. Brasil (2012).

monitor the national territory from space, thus providing support to the other Forces.

On the one hand, if this strategic monitoring by the FAB is a *leitmotiv* the END raises to the military sector, also the role of the AEB is not undervalued in the Strategy. In order to achieve the objective-purpose of the FAB, the AEB will need to update the Brazilian space program, assigning priority to

[...] the development of the space systems needed to expand the communications capacity [...], with special focus on the development of: a national geostationary satellite for [...] secure communications [...] (BRASIL, 2012c, p. 141).

So, of the PEB faces difficulties in adapting itself to the national needs and also is at risk of becoming one of the First National Programs to suffer government cuts, the military component - through the FAB - may become this pragmatic lead wire much expected from a space program.

The SGDC is a pioneer initiative in the Brazilian space field of knowledge, and it is important to demonstrate that the PEB is still alive. But it is far from being the triggering device for the long-awaited Brazil's "Sputnik moment" the various national public and private sectors really need. The geostationary satellite will have its own "SGDC moment", that is, modest and at the same time the ambitious goal of at last, seeing PEB liftoff.

## 5 FINAL CONSIDERATIONS

This paper discusses the scenario and the civil and military issues involved in the SGDC project to enable it to come out of the shelf and reach Earth's orbit.

As stated, two priority actions of the PEB are related to (i) the launching of satellites from the national territory and (ii) raising the PND/DAE to the status of State Policy. Just then, the strategic and geopolitical interest of space activities will be consolidated, in order to build up Brazil's autonomy and sovereignty (AGÊNCIA..., 2012, p. 10; BRASIL, 2012d, p. 65).

In this scenario, the construction of the first Brazilian geostationary satellite is fully consistent with the space program itself and with the directives of the PND and the END for the Space Strategic Sector, with regard to the search for increased autonomy, while at the same time, solving the problem of dependence on external sources to deal with Defense and strategic communications issues.

More than simply assisting in launching the SGDC into Space, the AEB has an important role to play: as the central agency of the SINAE, the AEB targets the integration and coordination of civil and military organizations and interests, aiming at the development of space activities. This civil-military integration is critical to all the strategic projects headed by the space agency, which include the development of the SGDC. This results from several factors among which are the following: as it

is a new body, the AEB still has not acquired the expertise and the know-how that will make it independent from the FAB – and the trend is to take this symbiotic partnership long into the future –; although a relative increase of allocated investments was evidenced in the last five years, the imminent budget cuts may further restrict the search for an autonomous development of sensitive space technologies; since the accident with the CLA, in 2003, the PEB has been trying to prove to be able to manage the best SLV base in the world, but with the probable end of the joint venture with Ukraine, Alcântara looks more like the best of the car race tracks, without any car to compete.

In view of this scenario, some alternative solutions are also envisaged: the first public contest promoted by the Agency was carried out, and the space area will be staffed in the near future; although a technical recession appears in the national economic scenario, the international space market continues to show an upward trend, and Brazil must not leave the CLA out of operation; if it is confirmed, the end of the joint venture with Ukraine opens doors to new partners, as for example Russia and the USA, even if the latter does not look favorably upon the influence of the military sector on the AEB; and, last, the very construction of the SGDC, whose project already evidences a mature view of the real needs of the Country and its limitations that derive from the means utilized to achieve the National Objectives.

Thus, the project of the first geostationary satellite to be made in Brazil, led by civil and military hands, evidences that for National Defense "space is indispensable to Brazil" (AGÊNCIA..., 2012, p. 9).

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## LIST OF ACRONYMS AND ABBREVIATIONS

- ACS** - Alcântara Cyclone Space  
**AEB** - Agência Espacial Brasileira (Brazilian Space Agency)  
**BID** - Base Industrial de Defesa (Defense Industrial Basis)  
**C&C** - comando e controle (command and control)  
**CLA** - Centro de Lançamento de Alcântara (Alcantara Lift-off Center)  
**COBAE** - Comissão Brasileira de Atividades Espaciais (Brazilian Commission For Space Activities)  
**COMDABRA** - Comando de Defesa Aeroespacial Brasileiro (Brazilian Airspace Defense Command)  
**DCTA** - Departamento de Ciência e Tecnologia Aeroespacial (Department of Airspace Science and Technology)  
**EMFA** - Estado-Maior das Forças Armadas (Joint Chiefs of Staff of the Armed Forces)  
**ENCTI** - Estratégia Nacional de Ciência, Tecnologia e Inovação (National Science, Technology and Innovation Strategy)  
**END** - Estratégia Nacional de Defesa (National Defense Strategy)  
**EUA/USA** - Estados Unidos da América (United States of America)  
**FAB** - Força Aérea Brasileira (Brazilian Air Force)  
**GPS** - Global Positioning System  
**GSI** - Gabinete de Segurança Institucional da Presidência da República (Institutional Security Office of the Presidency of the Republic)  
**INPE** - Instituto Nacional de Pesquisas Espaciais (National Space Research Institute)  
**IAE** - Instituto de Aeronáutica e Espaço (National Aeronautics and Space Institute)  
**LBDN** - Livro Branco da Defesa Nacional (National Defense White Paper)  
**MC** - Ministério das Comunicações (Ministry of Communications)  
**MCTI** - Ministério da Ciência, Tecnologia e Inovação (Ministry of Science, Technology and Innovation)  
**MD** - Ministério da Defesa (Ministry of Defense)  
**PEB** - Programa Espacial Brasileiro (Brazilian Space Program)  
**PNAE** - Programa Nacional de Atividades Espaciais (National Program of Space Activities)  
**PND** - Política Nacional de Defesa (National Defense Policy)  
**PNDAE** - Política Nacional de Desenvolvimento das Atividades Espaciais (National Policy on the Development of Space Activities)  
**PPP** - parcerias público-privadas (public-private partnerships)  
**PRODE** - produtos de defesa (defense products)  
**SGDC** - Satélite Geoestacionário de Defesa e Comunicações Estratégicas (Geostationary Defense and Communications Satellite)  
**SINDAE** - Sistema Nacional de Desenvolvimento das Atividades Espaciais (National National System for the Development of Space Activities)  
**SISDABRA** - Sistema de Defesa Aeroespacial Brasileiro (Brazilian Airspace Defense System)  
**TELEBRAS** - Telecomunicações Brasileiras S.A.  
**VLS** - veículos lançadores de satélites (Satellite launching vehicles - SLV, acronym in English)

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