THE BRAZILIAN NAVAL STRATEGY AND THE DEVELOPMENT OF THE DEFENSE LOGISTICS BASE

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ABSTRACT

This study aims to offer an interpretation of how the government's priorities for national defense and the evolution of the Brazilian Naval Strategy (BNS) have influenced the development of the Defense Logistics Base (DLB) that supports the Brazilian Navy, from the country's independence up to the present day. Then, it presents and develops the concept of DLB, discusses strategy concepts and its relation with defense policies, outlines how the organizational culture of the Navy has influenced decisions, and describes the evolution of the DLB of direct interest of the Naval Force, pari passu with the evolution of the BNS, highlighting external and internal influences it has received due to government changes and the introduction of the National Defense Strategy (NDS).

Key words: Defense Logistics Base. National defense. Naval strategy. Brazilian Navy.

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INTRODUCTION

For the realistic current of international relations, the States seek to ensure their own survival and sovereignty, and as they pursue this goal, they also seek to increase their relative powers.

Military capability is the main component of power. Then, its construction is an inalienable obligation, and no State that has non-negotiable assets to protect or intends to have international projection, may forgo designing and constructing its own defense resources.

Close to completing its 200th anniversary, the Brazilian Navy (BN) still depends mostly on international resources to have its combat inventory. If the Brazilian State needs survival like the others, and if it still has potential and aspirations to be among the most relevant nations in the world, why is its Navy not yet built on and supported by national bases?

The development of this fundamental instrument of defense, named by Brick (2011) Defense Logistics Base (DLB), and whose purpose is to construct and support military capability[3], depends on permanent policies of the State, which in Brazil have been conducted by governments that do not always prioritize defense issues. Another determinant factor of the delayed development of the components of this base, more directly related to Navy equipping, has been Naval Strategy itself. It was largely influenced by the organizational culture and the degree of administrative autonomy that the Naval Force has always had. Dagnino (2009, p. 64) addressed this issue and highlighted that the decision-making process regarding military equipment is developed within two distinct dynamics, a nationalist one, which advocates research and development (R&D), autochthonous development and exports of products of defense (PRODE), and a more traditional dynamics, submitted to an outdated and corporative military doctrine. The conflict between Mars and Vulcan[4], as pointed out by Giovachini (2000, p. 69), is reproduced in the Brazilian Navy as one

[3] DEFENSE LOGISTICS refers to the provision of means to compose the Armed Forces and keep their operations in any situations wherever they have to be employed.
DEFENSE LOGISTICS BASE (DLB) is the group of technological, material and human capabilities required to develop and support the military expression of power, but also deeply involved in the development of the industrial capacity and competitiveness of the country as a whole.

[4] Mars, the Roman god of war, would represent combatant officers and Vulcan, the god of fire, responsible for the forges with which weapons and Zeus' lightning bolts themselves were manufactured, the logistics and defense professionals.

of the characteristics of the defense environment in France immediately before World War 2 (WW2).

This study aims to offer an interpretation of how the government's priorities for national defense and the evolution of the Brazilian Naval Strategy have influenced the development of a DLB that supports the Brazilian Navy, from the country's independence up to the present day.

After this introduction, the second section presents and develops the concept of DLB. The third section discusses strategy concepts and their relationship with defense policies. The organizational culture of the Navy is summarized in the fourth section. The fifth section describes the evolution of the DLB of direct interest of the Naval Force, pari passu with the evolution of the BNS, highlighting external and internal influences it has received due to government changes and the introduction of the National Defense Strategy (NDS), and finally the conclusion is presented.

Primary data were obtained from the analysis of several documents, mainly declassified and internal of the BN, such as letters, memoranda and reports. Secondary data included works by several authors and semi-structured interviews with naval authorities. The analysis applied to these elements enabled to conduct a historical study of the tensions affecting the construction of naval power in national bases, and state that there is still a long way ahead.

DEFENSE LOGISTICS BASE

For Brick (2011), the national defense of countries as large as Brazil depends on two main and equally important instruments: its Armed Forces (AF) and the Defense Logistics Base. The concepts of defense logistics and DLB are very broad and include the provision of all kinds of resources for AF and the DLB itself, including human resources qualified for combat and defense logistics, and facilities for military, industrial, logistic support; science, technology and innovation (ST&I); and supplies (ammunition, fuel, spare parts, etc.), among others.

The DLB has several components of different aspects, but that interact with great intensity and that should be considered in a holistic and integrated way.

However, this study will only cover the equipping of combat resources and the provision of ammunition to the FA, as well as the development of and support to the necessary industrial and technological capability so that they can be provided in an autochthonous way. That is,

it will address the components related to the industrial and technological capability if the DLB, namely (BRICK, 2014, 2016):

a. Financing infrastructure of defense: financial institutions and resources dedicated to financing scientific and technological research, development of products for defense and export. The warfare product market has particular characteristics. Buyers and sellers are not in balance. There are few sellers and usually just one buyer, the State. The purchases take a long time to materialize and the products of defense (PRODE) demand constant technological updates. Without investing in research and development (R&D), it is impossible to have innovations, so products become quickly obsolete and no longer used. The States with advanced DLB usually finance the export of their defense products. On the other hand, the States that use foreign financing to obtain their military equipment end up weakening their DLBs and sustaining those of the creditor States.

b. Scientific and technological infrastructure of defense: universities, research centers and companies involved in the creation of scientific knowledge and technologies for defense products.

c. Intelligence infrastructure of defense: institutions and individuals involved in prospecting, collecting and analyzing information on scientific knowledge and technological innovations for defense. This component is justified due to the dynamism of technological progress and it is critical for the creation of new PRODE, or appropriate countermeasures. It is also used in the commercial intelligence for PRODE export.

d. Industrial infrastructure of defense: companies and organizations involved in the development and manufacture of defense products. It includes private and state-owned companies, as well as Military Organizations (MO) of the AF.

e. The infrastructure for the mobilization of national resources for defense: even in short-term conflicts, demands of every nature are increased and may even exceed the production and storage capacities. The State will seek to take civilian resources available in the country in the conflict. The conversion of civilian resources into military application, and back to their former condition – mobilization and demobilization – should be carefully planned and performed. Then, the whole infrastructure existing for these activities is part of the Base.

f. Logistical support infrastructure: developed to ensure the provision of defense resources during its life cycle. The availability of combat resources is one of the most important characteristics of a military

system. The maintenance and supply logistics, to offer repair and spare parts at the right moment, is critical in this process. These activities are performed by organizations belonging to the AF or other companies.

g. The infrastructure human resources training: its purpose is to recruit and train human resources for operational combat roles and for logistics roles of equipping and operations.

h. PRODE trading infrastructure: its purpose is to promote and support exports of these products for economic and political reasons.

i. Infrastructure for defense logistics management: acquisition, innovation and development of systems and PRODE and DLB support; and

j. Regulatory and legal framework: it regulates the DLB and gives the State the possibility of taking action for its support and development.

This whole complex that comprises the DLB requires personnel and appropriate processes for its management and intermediation, in the civil, military and governmental decision-making spheres, to maintain a proper flow of resources that are essential for the full development and sustainability of the DLB.

The Armed Forces are supported by the State. The industrial and technological component of the DLB, as the market where it operates has a monopsonic characteristic and the State is often the only buyer, should also receive from the State a guarantee of its survival. Thus, the construction and support of DLB are related to the military force project (BRICK, 2014).

Lastly, the capabilities of the DLB are not limited to generating defense products. They allow the development of high added value products and innovations and can also be used to design products for the civil market (dual use industrial capability). This way, the development of added capabilities of the DLB, because it operates at the threshold of technological development, has advantages not only for defense, but for the society in general. For this reason, it should have the support from the State, for reasons other than just defense strategies.

DEFENSE POLICIES AND STRATEGIES

The development of defense and its management is a political and strategic issue of the State. Liddell Hart (*apud* GONÇALVES CAMINHA, 1980, p. 53) divided the strategy into two: a strictly military one, "the art

of distributing and applying military means to fulfill the ends of policy," and the great strategy, which he used only to give a meaning to the implementation of a policy, coordinating and directing all the resources of the nation, or a group of nations, to achieve a political goal related to war.

In this division, the **great strategy** can be understood as a guide for the preparation and use of power, while the strictly military one, in this study the naval strategy, as a definer of the naval power application, as established by the political power. However, in the absence of a clear political direction for defense strengthening, and considering the tradition of military autonomy in Brazil, the BNS studies and develops a number of plans for the preparation and use of the naval power.

Such use reminds of operational and tactical issues of the power application, but not only these. The use of power is essentially dependent on political and strategic definitions for defense. Intertwined with use and also subordinated to those definitions is the preparation, which is closely related to the logistical issues of the planned application, such as personnel recruitment and training, material procurement, maintenance and distribution, etc.

The distinction between these two objects of strategies is very clear in the definition provided by Abel Cabral Couto[5] and adapted by Brick (2014):

> "Strategy is the science and art of developing, supporting and using the power of a political unit or coalition in order to achieve political goals that are considered vital and which raise or can raise opposition and hostility from another political unit."

Therefore, it is very clear that strategy involves two processes of very different characteristics:

a. the preparation of a political entity to act with more assertiveness and face possible conflicts with other actors in the international system that may eventually lead to a war battle; and

b. the general orientation itself for conducting the required actions, during and immediately before and after the confrontations (not exclusively war) that may occur. (Ibidem)

[5] Abel Cabral Couto. Uma Nova Base Conceitual para a Estratégia; in Duarte & Fernandes (2007).

Also according to Brick (2014), "the first process, which will comprise construction, logistics, or equipping of power instruments (DLB and AF), refers to long-term activities that require great efforts of planning, persistence and determination based on the choices, as well as involvement of practically all sectors of the society." In this process, the time to develop strategic actions can be measured in decades, and the profile of the strategist is that of someone who can conceive and build the structure (material, intangible and human means) that can be used in conflicts in which the political unit may be involved.

Since the concept of power is relational, not absolute, it is fundamental to plan and develop defense instruments that are at least equivalent to those of the other actors in the International System. Ideally, for countries as large as Brazil, with great potential power and aspirations for a more active involvement in international issues, a DLB should be able to innovate in an autochthonous manner, creating disruptive technologies and producing defense instruments to ensure unquestionable superiority in combat.

Just as there is a hierarchy between nations in terms of combat capacity, ensure by a collection of existing means at a given moment, there is also a hierarchy in terms of industrial capacity and innovation for a future combat capacity. The latter is critical for speeding up technological developments that quickly make the defense means obsolete.

Bitzenger[6] (2009) reports 3 levels of capabilities: critical innovators, adapters and modifiers of advanced technologies, and finally, reproducers of existing technologies. Brazil is at the lowest level of this hierarchy and, therefore, any defense policy and strategy to be effective (or an effective power) should attempt to change this situation.

Preparation and use require high-level definitions, budget support, funding and economic incentive, proper legislation, among other actions of political power that often do not exist or are imprecise or incomplete.

A possible explanation for the lack of priority in developing and supporting a DLB that can supply the Armed Forces could be the fact that the Brazilian constitutions define that the AF should defend the nation without, however, being concerned about how the equipment will be

[6] Bitzinger, R. A. Challenges Facing the Global Arms Industry in the 21st Century (in: Bitzinger, R.A. (Editor) The Modern Defense Industry. Praeger Security International. Santa Barbara, CA, USA. 2009).

provided or funded, suggesting this is considered a secondary issue by the legislator. Defense, however, is comprised of the construction of power and use of military power. Even after the development of recent national defense and strategy policies, the construction of power has a gap in the Brazilian legislation that should be fulfilled.

Historically, the Executive Power, in terms of defense, concentrates its action on the application of budgetary restrictions. The Legislative Power, on the other hand, has no tradition of promoting continued debate on military matters that imposes equipment as a State's need. With the autonomy already mentioned, the Forces conduct particular projects supported by their budgets.

A reasonable justification for this absence of political power in defense issues may be the low electoral return that it offers, given the major needs observed in other sectors. The fact that the largest conflict in national territory took place far from the major urban centers and almost 150 years ago, does not contribute to a greater concern about defense. In addition, the country's participation in the World Wars and other military actions that followed under the aegis of the United Nations was very small. Finally, today, the external threats are unclear and of low probability, making them almost imperceptible to citizens.

On the other hand, it is important to point out that this situation creates an opportunity to increase investments in research and development and reduce resources for the maintenance of large inventories of means and personnel, which has not been used.

According to Flores (2002), during periods of peace, military leaders do not usually adopt major changes in doctrinal concepts, although they have consolidated in past circumstances, of questionable application to future conflicts, for which there should be military power preparation. Considering such conservatism, changes in strategy do not happen at the same speed as the current development pace.

Finally, the AF assume a role that goes beyond their capacities, creating advantages but also deficiencies that are characteristics of an imperfect system, which, in general, suffers from a lack of superior support and particularly of the Navy, and is influenced by the experiences and convictions of the naval chief who leads the Force in that period and military conservatism.

THE NAVY AND ITS ORGANIZATIONAL CULTURE

In the theory of organizational development of management sciences, the concept of organizational culture[7] has great influence.

The Navy administration is guided by the good practices of public administration. However, as a complex, traditional, highly hierarchical and combat-oriented governmental organization, it has characteristics of a military environment. The most important decisions are made by a group of people comprising of general officers of the highest rank, who are supported by a system of consolidated planning and supporting bodies. However, the influence of the officer's experiences and convictions on the choices is undeniable. For instance, the change in the naval program in 1904, promoted by Admiral Alexandrino de Alencar, resulted in the program implemented in 1910. In the 1980s, Minister Saboia decided to acquire some used equipment from other navies, restarting a procedure that abandoned by previous administrations: opportunity purchases[8]. More recently, in 1990, Admiral Flores took over the Navy and intensified the activities required to develop a nuclear submarine. His successor, however, slowed down the process and kept a more traditional naval power.

Considerations for choices often contradict the logic of long-term power construction. Immediate operational needs to fulfill the mission of the Force have an impact on the decision. In this sense, the need for resource availability, the redundancy of organizations, resources and personnel are taken into account. The personnel also require special attention, since warships large and diversified crews.

It is well known that the sea crew training is complex, of long duration, and should not be seen individually, but based on the whole

[7] It is the system of shared beliefs and values that develops within an organization or within a subunit and that guides the behavior of its members (CHIAVENATO, 2011, p.380).

[8] The opportunity purchase of foreign ready-made means is a resource usually employed to quickly fill the gap of operational deficiencies. Due to their attractive price, either because it has become technologically outdated in relation to the supplier's inventory, or because of their increasing maintenance costs, the purchase is irresistible, mainly because it will replace a platform that is even more outdated (VIDIGAL, 2002, p.5). The purchase, however, undermines the nationalization effort, as well as any increasing pressure on the logistics system, which is already stressed by ships under construction and still has to prepare to meet an unplanned purchase of equipment, often outdated and with many different and discontinued systems (Ibidem).

naval environment and in the interaction with others crews during naval operations. According to Fonseca (1988, p. 60), a sailor needs frequent contact with the sea, because one day in the sea would correspond to a few days of training in land simulators. It should also be noted that, for functional progression, it is necessary to fulfill career requirements such as the time of boarding, the performance of duties and the command on board, which in the absence of operational means could not be achieved.

The maintenance of the training and the operational capacity achieved are aspects that influence the decision-making process of the highest military levels, causing economic issues, such as sunk costs and opportunity costs, to replace those military needs. For example, during the Paraguayan War, in the absence of political events that demanded naval actions, and with the need to reduce the consumption of that expensive imported fuel used in battleships, the Baron de Cotegipe was concerned about the long periods of those ships at ports, with impact on crew training, motivation and discipline. In this sense, he highlighted the importance of maintenance of old wood steam ships, even when conflicts used battleships, of more expensive maintenance (MARINHA DO BRASIL, 1869, p.15). According to Gastão Penalva (p. 62, apud CAMINHA, 1989, p. 265), Admiral Alexandrino de Alencar, when explaining his motto "going to the sea," reinforced the idea that the Navy needed to exercise constantly in order to make good use of modern ships. Another more current example was the investment in the São Paulo Aerodrome Ship, of high maintenance costs, and whose tactical use requires a variety of other means that are not available to the Navy.

It remained in the inventory for 16 years, for the same reasons mentioned above, and was deactivated only in 2017, given the budgetary reality that was not sufficient to guarantee an acceptable operational availability.

Without naval means, it is impossible to perform exercises, operational evaluation, testing and formulate new doctrines. Hence the importance and the ever-present concern of the top administration of the Navy about having naval means, even if outdated, to prevent crews from becoming idle, untrained, and unable to meet operational and administrative requirements of warfare navy.

The technological evolution of the naval war, which began in the Industrial Revolution, developed in the World Wars and has not stopped so far, creating a barrier for technologically backward countries, such as

Brazil, to equip their Naval Force with updated national means.

This new reality confirms that the challenge of building and supporting an adequate DLB for countries as large as Brazil is much greater than equipping it with imported means and keeping an armed force ready to operate. That is, if it is difficult to improvise a military combat capability, it is much more difficult to do the same for an industrial and technological capability. It is possible to prepare an armed force to operate in relatively short periods, of a few years, as Brazil has already proved in the conflicts in which it has been involved. However, it does not happen with the preparation of industrial and technological capability. This activity requires many decades of planning and activities performed with persistence and determination. Therefore, it does not depend on a single government administration, let alone on the AF, which have other purposes than to develop and support industrial and innovation capabilities.

These different perceptions are common in the military environment starting in the 20th century, when the paradigms of industrial warfare, in the first instance, and of the current technological warfare have prevailed. A significant number of military personnel in various armed forces have argued that without a proper DLB, it would not be possible for a country to have effective defense. Without being able to monitor the developments abroad and, given the easy purchases abroad, the ideal of having the ready-made means to meet the needs of the Navy became stronger.

Dagnino (1989) reports that, with the loss of importance of the Navy in relation to the Army, starting in the Brazilian Naval Revolt in 1893, the Naval Force began to worry more about the training of its officers. Given the impossibility to manufacture the equipment it needed, the technological qualification achieved by its officers favored "acquisitions" and "how to use," instead of "how to produce," determining a less production-oriented profile than in other forces. Then, a clear predominance of Mars' logic over Vulcan's is observed in the conflict of ideas, which is mentioned by Giovachini (2002, p. 69).

On the other hand, it is important to recognize that, despite purchasing combat means abroad, the desire to acquire defense equipment locally has always been present in naval administrations. In 1831, the Viscount of Itaboraí (MARINHA DO BRASIL, 1831, p. 6 & 7) reported the importance of creating an engineering program for the shipbuilding

industry. When Admiral Aristides Guilhem was in charge of the Navy, from 1935 to 1945, he implemented the Naval Program in 1932, resuming ship construction, which had been suspended for more than 30 years, and the development of other means that are critical to logistics, such as naval schools, bases, warehouse, factories of ammunition, gunpowder and torpedoes. In the 1970s, the Navy performed the construction of two Niterói class frigates, with great development of operational and support capabilities. At the end of the following decade, the Navy performed the construction of corvettes and submarines. These were important efforts, significantly driving the DLB growth, but always with limited volume, not allowing continuity.

EVOLUTION OF NAVAL STRATEGY AND ITS IMPACT ON DLB DEVELOPMENT AND SUPPORT

Vidigal (1985, 2002) defined the development of Brazilian naval strategic thinking in three evolutionary phases. The first phase of English influence, the second phase of American influence, and the third phase of autonomous thinking. A separate chapter, which can be considered as a new phase, started in the second administration of President Lula, with the approval of the National Defense Strategy in 2008. In this new phase, the naval power creation, as well as its use, started to be built locally, with an important role in the governmental sphere.

ENGLISH INFLUENCE (1822-1910)

With the country's independence, the newly created Brazilian Navy was directed to the overseas naval force to support of an imperial government policy, very active in the Rio de la Plata basin. It was organized according to the influence of its first admirals of English origin. In logistics, it inherited the Royal Arsenal of the Navy, of 1763, renamed National and Imperial Arsenal of the Navy, with other arsenals spread along the coast, such as in Bahia, Pernambuco, Maranhão, Pará, São Paulo (Santos), and Santa Catarina. Technical personnel were scarce and most of the rigging material was foreign. However, they were concerned about equipment nationalization, as well as the creation of an engineering program for shipbuilding (MARINHA DO BRASIL, 1831, p. 3, 6 & 7).

The investments in the construction of naval power were on impulse, due to the crisis, as observed during the conflicts in the Rio de la Plata basin. As the external situation stabilized, they lost strength, just as technological developments accelerated, in a country where everything was not yet done. As pointed out by Vidigal (1985), the authorities (politicians, diplomats and the military) had a strategic conception that valued the acquisition of foreign ready-made means more than investments in national design and construction. This phase, which lasted until 1910 (VIDIGAL, 2002), was important for the Navy in the country's strategic conception. Considering the industrial immaturity of Brazil, investments in shipbuilding were significant.

With the republic, the political importance of the Army increased, contributing to a greater autonomy of this segment in terms of military and defense issues. The Navy was beginning a period of decline, which became worse and ended up with the Brazilian Navy Revolt in 1893.

AMERICAN INFLUENCE (1910-1977)

This period covers the two major world wars and the beginning of the Cold War, in which the scientific and technological development for military use in war, besides intensifying the technological restriction imposed by the great nations on the least developed countries, showed the extreme fragility and external dependence of the Brazilian Naval Force on acquiring and maintaining its combat means and conducting naval operations.

In the World War 1 (WW1), the Navy was clearly behind in terms of combat techniques, leading to a debate for fleet restructuring. As Admiral Vidigal (1985, p. 74) pointed out, the American Naval Mission began in 1922, supporting the Navy reorganization.

The required industrialization in Brazil, perceived by the government in the 1930s, began the import replacement model. To finance the Navy equipment by means of Decree nº 20.923, of January 8, 1932, Admiral Protógenes Pereira Guimarães, then Minister of the Navy, created the Naval Fund to promote the renewal of the floating equipment of the Navy. During the next naval administration of Admiral Henry Aristides Guilhem, a new shipbuilding phase started in the country.

The WW2, just as the WW1, also showed how the Navy was behind in a modern war. The Navy's equipment to face underwater

threats had to come from the United States, where it was abundant and inexpensive. In 1945, the Brazilian strategy became operationally and materially subordinated to the North American strategy. Besides the technologically outdated equipment, training, doctrine and the enemy were also "supplied."

The BNS in 1950 interpreted that the Navy was much behind Brazil's potential for global projection and the minimum tasks it should perform. To create the required naval power, Minister Sylvio de Noronha believed the budget was insufficient and proposed the creation of a permanent fund. In 1951, Law 1383, of June 13, 1951, was approved, which increased the resources for the Naval Fund. However, since it came into effect, the regular budget was reduced for works, spare parts and other materials for the fleet. In practice, there was a reduction in resources available (MARINHA DO BRASIL, 1952, p. 392).

In the administration of Juscelino Kubitschek, under Law 3.381, of April 24, 1958, the Merchant Navy Fund and the Merchant Marine Renewal Fee were created to provide resources for the renewal, expansion and recovery of the national merchant fleet, and for the development of the shipbuilding industry in the country.

In 1957, the first naval engineering program started operating, as a result of an agreement between the Navy and Escola Politécnica da Universidade de São Paulo (USP). In 1959, the Navy Research Institute (IPqM) was created to cover all fields of science and technology for the Navy, except for naval engineering, for which there was already an agreement with USP.

In 1963, the Navy's first Master Plan (MP) and its respective guidelines were approved. The MP started to adapt the credits to the needs, creating an instrument for better use of the financial resources, and to ensure administrative continuity.

The Military Assistance Program (MAP), which provided Navy equipment, was still in force when the equipment renewal program of the Navy indicated in 1967 the need for nationalization of means, components and spare parts. In this context, the Master Plan included the Golf Program for equipment nationalization. Despite the success achieved in some aspects, the culture of the Navy could not be changed, as it was much easier to acquire equipment through the MAP[9].

To conduct its renewal program, the Navy attempted to acquire new equipment, but, as Admiral Vidigal (1985, p. 101) pointed out, the United States

[9] Interview with Vice Admiral (EN-RM1) Marcílio Boavista da Cunha, in Rio de Janeiro, on May 12, 2014.

imposed more obstacles than the Europeans for the provision of such means. That was when the BNS started to move away from the American influence. During the administration of Minister Augusto Rademaker (1967-69), contracts were signed for the construction of Aratu class sweepers in the former West Germany and Humaitá class submarines in England. In the following administration, Minister Adalberto de Barros Nunes signed a contract for the construction of Niterói class frigates. Of the six vessels purchased, two were built in the Navy Arsenal of Rio de Janeiro (AMRJ). The construction of Independência frigate in the AMRJ, which started on June 11, 1972, was an important step for the development of the national warfare industry.

The incorporation of the first sweeper (Aratu) required adaptations of the logistics infrastructure for the sweeper maintenance. Likewise, the incorporation of Humaitá submarine and Niterói frigate brought new logistic services, due to its digital systems, equipment, sensors and modern armaments. During the administration of Minister Azevedo Henning (1974-79), the Navy Electronics Center, the Naval System Analysis Center (CASNAV) and the Navy's Submarine Missile and Weapon Center were created.

In 1970s, the Estado-Maior da Armada (Navy's general management body) created the Constellation Plan, an administration tool developed to prepare the entire Navy for the new ships. That plan was coordinated by then Commander Mauro Cesar, future Minister of the Navy under the Fernando Henrique Cardoso's administration, and it increased the general level of knowledge of the Force, which no longer returned to the previous condition, as it had happened to the Golf Program[10].

The search for the construction and support of an industrial-technological capability to design and build warships in Brazil, which was intensified in this phase and continued in the following years, was explored in 11 studies by Vice Admiral (Refo EN) Élcio de Sá Freitas, published in the Revista Marítima Brasileira, from 2006 to 2013 and later published as a book (SÁ FREITAS, 2014).

10 The same.

AUTONOMOUS THINKING OF NAVAL STRATEGY (1977-2008)

This phase started when President Geisel ended in 1977 the Military Agreement with the United States, signed in 1952. As a consequence, the Military Government reformulated the War Hypotheses and the Navy created new policies and guidelines (VIDIGAL, 2002, p. 15). A period started of strong growth of the national warfare industry.

During the administration of Minister Maximiano da Fonseca (1979-84), the economic crisis in the country became worse, but the minister sought to preserve the shipbuilding capability that had been acquired. His decisions were:

> Only acquire ships used abroad in very special or urgent cases, which in fact was the recommendation of my predecessor, Admiral Geraldo Azevedo Henning; and to the extent possible, use private shipyards for military constructions, even with some impact on AMRJ activities. (FONSECA, 1988, p. 80)

The Minister's attitude reflected the naval strategy, transcribed in the 1982 Navy Report:

> In the absence of short-term reasons in the context of security that justify the allocation of important resources, the Navy seeks to encourage the government to start a re-equipping program of modest and extensive phases, emphasizing the nationalization factor. (MARINHA DO BRASIL, 1982, p. III-9)

Also using the Naval Fund, Minister Maximiano decided to build in the AMRJ the new school ship, two Inhaúma class corvettes, hospital ships, and instruction notices, and in the Verolme shipyard, two Inhaúma class corvettes. He also decided to buy two Tupi class submarines in Germany and build the third submarine in the Navy Arsenal.

As Admiral Maximiano described in his book-report, the equipping program required external financing, and receiving resources

from private sources was not permitted to the Navy by law. As suggested by the Planning Department of the Presidency of the Republic, Empresa Gerencial de Projetos Navais (EMGEPRON), a company for naval projects, was created by Law 7.000 of June 9, 1982. The company had to find financial resources abroad, sell military products, promote the Brazilian naval military industry, manage projects belonging to programs approved by the Navy, and promote and conduct activities related to the procurement and maintenance of naval military equipment (FONSECA, 1988, p. 44).

Another important activity conducted during the administration of Admiral Maximiano was nuclear research, a theme whose importance had already drew the attention of the Navy for submarine propulsion and, for this reason, the Navy had sent officers to study abroad, such as Commander Othon Pinheiro.

At that time the Army and the Air Force also conducted studies on uranium enrichment, showing a division and independence of efforts.

With the end of the military dictatorship (1964-1985), the naval strategy went through a period of intense political and economic transformation, both in the external scenario, with the end of the Cold War, and in the internal scenario, with the civilian governments, forcing the Ministers of the Navy to promote strategy changes. These changes, combined with the political and economic transformation, caused an impact on the naval DLB, which started to decline.

The administration of Minister Henrique Saboia still continued the shipbuilding activity but, with the extended economic crisis, which delayed the delivery of ships under construction, and the reduction of means that reduced the operational capacity of the Force, they resumed the acquisition of means used abroad.

Another problem that affected the achievement of the goals set for the Navy's equipping program was the loss and insufficient replacement of technical personnel, mainly in the Engineering area of the Navy and AMRJ (MARINHA DO BRASIL, 1985, p. V-05).

With President Fernando Collor, Admiral Mário César Flores took over as the Minister of the Navy. Flores, known for his strategies, tried to adopt a focus on nuclear propulsion submarine. However, the difficulties from the previous management remained and affected the nationalization achieved by the shipbuilding activity. The funds for the development of the Brazilian Nuclear Program were significantly reduced, forcing Admiral Flores to use resources from the Force itself to cover the amount not

received from the government to keep the activities conducted at the Navy Experimental Center in Aramar. The Operations Sector could no longer accept delayed delivery of ships and be affected by the low availability of existing naval assets.

Then Collor's administration was interrupted and Itamar Franco took over, with Admiral Ivan da Silveira Serpa as the new Minister of the Navy. Serpa was concerned about discipline and lack of training. As already mentioned, the lack of vessel movement affects personnel motivation, discipline and training. Many naval facilities were aged and needed spare parts, an obstacle to their maintenance. The ships under construction were delayed. Then, Serpa decided to buy several vessels used abroad. In an interview to Celso Castro and Celina D'Araújo, he said:

> "I thought it was necessary to continue the modernization of frigates, remodeling of Minas Gerais aircraft carrier, and that it was necessary to acquire second-hand ships abroad to compensate for the delay in our shipbuilding plan. This delay is largely due to financial restrictions, but partly to the administrative instability and capacity of our shipyards. We needed to acquire Lynx helicopters in England, to improve our attack fleet and buy a helicopter in the United States, like SH3, to expand our general and anti-submarine activity. I came from the Naval Operations Center, so my sensitivity to these things was probably stronger" (CASTRO & D'ARAÚJO, 2001, p. 191).

Despite the financial challenges of the period, on December 21, 1994, the laying down of the keel for Barroso corvette took place in the AMRJ. Less complex vessels, such as 200-ton patrol vessels, was built and delivered to civilian shipyards, including the INACE, in Fortaleza, Ceará. Regarding the modernization of Niterói class frigates, the system integration management would be conducted by the Navy itself, increasing its experience. In addition, the system of Military Service Providers (OMPS) was adopted, which would be improved in the following administration and that allowed a better understanding of the real costs of service provision.

On July 30, 1994, the Real Currency Plan came into force, with reforms to achieve monetary and economic stability. The subsequent

administration, of Fernando Henrique Cardoso (FHC), launched in 1996 the National Defense Policy, presenting defense goals, a strategic behavior, and the Brazilian guidelines for external threats. The creation of the Ministry of Defense (MD) became a project for the second administration. His Minister of the Navy was Admiral Mauro Cesar Rodrigues Pereira, who had the same problems experienced by previous administrations: delayed and reduced resources for the Navy, requiring complementation of the Naval Fund.

Despite the financial issues, Minister Mauro Cesar started the modernization of Niterói class frigates and intensified the personnel training in the Operational and Material Sectors by offering new postgraduate courses. In the area of Science and Technology, the entire system was reformulated, with the creation of S&T councils and commissions, comprised of representatives of the Sectorial Management Bodies (ODS) and the Estado-Maior da Armada (Navy's general management body). Shipbuilding in the AMRJ was represented by Barroso corvette and Tapajó and Timbira submarines. In addition, the Navy involved private shipyards in the construction of less complex vessels, such as INACE (in Fortaleza, Ceará) for patrol vessels, WILSON SONS (in Santos, São Paulo) for buoy tenders, ERIN (in Manaus, Amazonas) for patrol boats, BELCONAV (in Belém, Pará) for personnel shipping vessels (MARINHA DO BRASIL, 1996, p. A-8 & A-9). A positive result of the continued orders built in private shipyards was the export of a 200-ton patrol vessel built by INACE for the Namibian navy in 2009.

For his second administration, FHC chose Admiral Sérgio Gitirana Chagasteles as the Minister of the Navy. He remained in this role until June 10, 1999, when he was named Commander of the Navy (CM), after the creation of the Ministry of Defense (MD).

Until 1999, each Force made its own arrangements of preparation for all possible uses in its field of operation. Complementary Law 97 of June 9, 1999 (amended in 2004 and 2010), inserted the MD in the defense structure and brought new orientations to the AF. The respective Commanders were in charge of the **preparation** of the operational and support bodies of the Forces, **observing the policies established by the Minister of Defense** (compliance that started to be considered due to the reduction in the status of this role). It was only in 2010, with the new legal

frameworks[11], that the body reached the managerial level to define and implement a policy for an integrated force project. Besides the absence of this project, the initial documents did not set priorities properly. The 1996 PDN itself was vague, stating that "the Armed Forces shall be adjusted to the political-strategic stature of the Nation and structured in a flexible and versatile way to promptly and effectively act in different areas and scenarios." However, the 'stature' was not outlined, making it a vague qualification. Then, each Force remained with high autonomy, developing a wide range of military capabilities to meet subjective criteria, which ended up competing for a limited budget.

FHC's first administration faced three major external crises (Mexican crisis in 1994, Asian crisis in 1997, and Russian crisis in 1998). And FHC's second administration also saw deterioration of economic conditions. In 1999, the Naval Fund and the Fund for Maritime Professional Development, which were the Navy's own resources[12], started to be controlled and subject to the "Limite para Movimentação e Empenho" and "Limite de Pagamento" (limits of contribution).

Despite the financial issues, efforts were still observed for progressive and selective equipment nationalization. The project for production and mechanical strength tests of composite propellant grain for the ASROC rocket engines was ordered to AVIBRAS. ELEBRA and CONSUB participated, with IPqM, in the development of electronic warfare equipment (ELEBRA) and sonar transducers (CONSUB). At the Centro Tecnológico da Marinha in São Paulo (CTMSP) two units of two-axis dry tuned-rotor gyroscopes were developed. The process of nationalization of 40/L70 3P ammunition and 20 mm and 105 mm ammunition continued. Also, systems for predicting active sonar range (IPqM) and cryptographic algorithms (CASNAV) were developed, as well as the nationalization of smaller items of low technological complexity, but relevant to the Navy's supply system (MARINHA DO BRASIL, 1999a, p. 24).

Admiral Roberto de Guimarães Carvalho was chosen by President Luiz Inácio Lula da Silva as Commander of the Navy. His challenges were:

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11 Complementary Law 136, of August 25, 2010 and Decree 7276, of August 25, 2010.

12 The Navy's own revenue sources (which do not come from the government budget) are: royalties for the production of oil and natural gas; funds of beneficiaries allocated to the Military Health Fund; remuneration of bank deposits; lighthouse use fee; contribution to the development of Maritime Professional Education; a quota of the additional amount of the freight for Merchant Navy renovation; hospital services; administrative services, and other sporadic sources.

conclude the modernization of frigates, submarines and São Paulo vessel, continue the construction of Barroso corvette, end Tikuna submarine, and continue the technological projects of the Navy – all these assignments with a tight budget. Despite these challenges, the modernization of the frigates was concluded, the Tikuna submarine was sent to the sea, and the CTMSP, even with its activities in a vegetative state, concluded the final assembly of the pressure vessel and internal elements of the reactor for the Nuclear-Electrical Generation Laboratory, besides providing ultracentrifuges of uranium enrichment for the Nuclear Industries of Brazil (BRASIL, 2006, p. 90).

In his second administration, Lula chose Admiral Júlio Soares de Moura Neto. Although budget restrictions were expected, some factors allowed a different scenario: the economy grew driven by imports of raw materials from China, the replacement of Antônio Palocci with Guido Mantega as the Minister of Finance allowed an increase of the primary spending of the government and PETROBRAS announced the discovery of the Tupi oil field. The need to protect this wealth attracted the attention of the Navy, which was already promoting the "Blue Amazon" concept with the United Nations to extend its maritime area to the limits of its continental shelf.

In May 2008, the Production Development Policy was launched, which defined measures that included the Mobilization Programs in Strategic Areas, with emphasis on the Industrial Complex of Defense and the Nuclear Energy Complex. Focused on the recovery and growth of the industrial installed base, three goals were set for the Industrial Complex: invest R$ 1.4 billion in modernization and RD&I, increase by 50% the national supply in defense purchases by 2010, and increase by 80% the national supply in defense purchases by 2020. For the Nuclear Energy Complex, the goals were: consolidate the country as a major manufacturer of nuclear fuel, increase the supply of electrical energy, and develop other skills in the nuclear area. The goals set for 2008 and 2009 favored the recovery of the activities conducted by the Navy in Aramar.

FROM THE NDS PHASE ONWARDS, A NEW STRATEGY, BUT THE SAME PROBLEMS

In January 2008, Nelson Jobim became the Minister of Defense. With Professor Roberto Mangabeira Unger, Minister of Strategic Affairs,

he coordinated the work group that developed the National Defense Strategy (NDS), approved by Decree 6.703, of December 18, 2008.

The NDS, combining defense and development, expressed a clear intention to recover the Brazilian military power, which could only be done with a proper budget. These factors initially contributed to increased resources of the Navy.

The strategy establishes that the reorganization of FA takes place around operational capabilities and, particularly regarding the BN, it promotes the development of nuclear competences; "the second structuring axis refers to the reorganization of the national defense material industry to ensure the equipment supply needs of the Armed Forces is supported by national technologies." The naval planning expanded the acquisition/modernization of the necessary means, assigning high priority to submarines and patrol vessels, and leaving escort ships, aerodrome ships and other supporting ships for later.

Beginning with Lula's commitment to provide the necessary resources to conclude the Navy's nuclear project, the Force revised its studies, reintroducing the nuclear submarine as a priority in the naval strategy. Then, it created the Submarine Development Program - PROSUB, a €6.7 billion project that includes the construction of a shipyard, a submarine base in Itaguaí, in the State of Rio de Janeiro, the construction of four conventional submarines and one with nuclear propulsion. The General Coordination of Nuclear Propulsion Submarine Development Program (COGESN) was also created, which managed two major projects: the Navy Nuclear Program, conducted by CTSMP, and PROSUB. Of the PROSUB cost, €746 million refer to the payment of technology transfer to the Defense Base (BRASIL, 2009). Observing the final provisions of Decree 6.703/2008, the Navy Equipping Program, was replaced on June 30, 2009 with the Navy Articulation and Equipment Plan - PAEMB. The Navy's priorities in the PAEMB are: recovery of operational capacity; the Navy Nuclear Program; the construction of the Naval Power center; the Blue Amazon Management System (SISGAAz); the Naval Complex of the 2nd Fleet/2nd Force of Marine Corps; safety of navigation; the personnel. The expenses accounted for more than 200 billion reais in twenty years. The high defense expenses attracted the interest of traditional and new companies in the national and foreign military sector, besides the acquisition of national defense companies by foreign companies.

However, the national ST&I system remains limited, either due to

the loss of capital control of national technology developers to foreigners, or because of low demand for cutting-edge products in the country, seeking supplies abroad. The long-term goal of the DLB, pursued by the NDS, is to meet the needs of defense products, without relying on external sources of supply, remains in force.

To develop, absorb, transfer and maintain technologies related to nuclear activities and the elaboration of projects, monitoring and inspection of submarine construction, Amazônia Azul Tecnologias de Defesa S.A – AMAZUL was created by Decree 7.898, of February 1, 2013. AMAZUL, Itaguaí Construções Navais, and the new investments in the CTMSP represent a major advance for the DLB. However, other important infrastructure of the Navy has not had a greater involvement in the project, such as the AMRJ (which will be in charge of Tupi submarine maintenance only), the Ship Design Center, EMGEPRON, IPqM, among others. The incorporation of PROSUB into COGESN generates the risk of returning to the previous knowledge condition, when the initial drive dissipates, which may be approaching, as indicated in the table below, which shows the amounts paid from government programs for the construction of naval power:

RESOURCES PAID BY EACH PROGRAM (R$)

YEAR	Program 0622 – Naval power preparation and use	Program 0626 – Equipping and adaptation of the Brazilian Navy	Program 0629 – Naval technology
2008	713,786,579.97	314,869,554.18	112,975,251.74
2009	789,174,131.01	884,303,593.69	142,491,021.98
2010	624,683,900.46	3,048,358,700.49	50,461,945.44
2011	715,276,012.64	1,875,044,970.22	161,717,996.02
2012	278,175,859.79	524,454,346.85	31,356,065.76
2013	17,398,777.78	139,323,128.32	3,980,669.61
2014	4,463,385.55	65,712,328.62	2,016,036.89
2015	48,145.52	784,338.83	0.00

Source: Portal SIGA BRASIL, Senado Federal.

The recent acquisition of Amazon ocean-class patrol vessels, when the NDS 2008 was already in effect, show how the lack of resources and operational needs still put pressure on the Navy.

On the other hand, recent efforts have been dedicated to DLB development: revision of the Navy's ST&I structure, with an increase in the ODS level, launch of programs and partnerships with ST&I (ICT) institutions outside the BN, and cooperation with universities; development of technological projects in private companies with the participation of the Brazilian Navy's ICT. For example, the Esporão Program, which intends to develop a national heavy torpedo; a submarine-launched anti-ship missile; a cylindrical sonar; a combat management system based on the SICONTA system family of IPqM; and an Integrated Platform Management System (IPMS) (CASTRO, 2012).

Despite the Navy's efforts, there are still DLB infrastructures that support the Naval Force, more dependent on the action of the political power, that need to be developed, such as financing, establishing a legal framework to promote the production and trade of defense products. For example, the PROSUB implementation required an authorization from the National Congress for external financing from the French bank Paribas (BRASIL, 2009). The financing infrastructure should be improved, considering that, as mentioned above, external contributions supports the DLB of the credit State. However, in the regulatory aspect, the government has expanded its actions for defense, establishing a legal framework that mainly includes the National Defense Policy, the National Defense Strategy, the National Defense Industry Policy, Law 12.598 (which created the Special Tax Regime for the Defense Industry) of March 21, 2012, Decree 7.970 (for the creation of the Joint Commission of the Defense Industry – CMID), of March 28, 2013, and Decree 8.222 (which regulates the Special Tax Regime for the Defense Industry), of October 16, 2013. However, this legislation shows difficult enforcement and it is temporary. Besides the CMID, the Department of Defense Products was created in the MD.

The CMID is the highest level body that proposes and coordinates studies on national defense industry policy and integrates the MD with public and private bodies and entities related to the DLB. It involves the MD, the Ministry of Finance (MF), the Ministry

of Foreign Affairs (MRE), the Ministry of Industry, Foreign Trade and Services (MDIC), the Ministry of Science, Technology, Innovation and Communications (MCTIC), the Ministry of Planning, Development and Management (MP), as well as other bodies that have been invited to the advisory groups (such as FINEP, BNDES).

Brick (2014) highlights that, for effective public policies to construct and support a DLB, three basic governance requirements should be concentrated on a single actor: responsibility, authority and accountability. However, in the NDS, the authority and responsibility for the construction of military power are dispersed among various government agencies, such as: Civil Cabinet, MD, MDIC, MP, MRE, MCTIC, AF, etc. As this study shows, the Navy has a strong role in the construction of its military capability. Despite the creation of the CMID, it does not replace a role in charge of the DLB, which does not exist.

Many infrastructures that do not exist in the civil environment, or that cannot fulfill the demand of the Navy, have been created in the naval structure. Shipyards, research institutes, logistic and mobilization units able to meet the requirements of the naval means were eventually constituted by the Navy's MOs. These MOs were submitted to the budget, rules, personnel management, use of technical workforce in administrative activities, legal limitations for contracting, independence of profit generation for business survival, among other particularities that characterize the military administrative environment

In all phases of the naval strategy efforts were dedicated to the DLB development. But the military decisions follow their own pattern, which considers special aspects. Even though it is in the autonomous thinking phase, and with a new legal framework, such as the National Defense Policies and Strategies, which makes one believe that the strategy has reached a new evolutionary phase, naval means are still bought abroad and a strong prioritization of the Force's operational capability is observed. The DLB does not have proper protection. Mars is still overlapping Vulcan.

CONCLUSION

This study analyzed the performance of the Naval Force in the development of its Defense Logistics Base

Although the concept of strategy points to a more active participation of the Political Power in the definitions of preparation and use of military capability, the long-time distance of politicians from military matters led the Armed Forces to a more engaged performance. The administrative autonomy of the forces grew and stimulated them to internally fulfill their equipment needs.

In the Navy, some typical DLB infrastructure activities, such as the development and manufacturing of PRODE, are performed by MOs. Despite the Force's extensive efforts, the system has deficiencies, because these MOs do not have the administrative freedom of private companies and still compete for the budget of the Force.

The organizational culture, as presented, prioritizes operational training, without which its mission could not be fulfilled. In this sense, the opportunity purchases that fill urgent operational needs are factors that weaken the DLB, always a debatable issue.

On the government side, economic crises have always permeated the Brazilian history. In the absence of perceived threats, military capacity building has not been included among the political priorities.

Since the country's independence, in all stages of the naval strategy development proposed by Admiral Vidigal, the investments in navy equipment of national production have been made on impulse, losing energy as soon as foreign political crises dissipate or economic crises worsen. This was the case in the conflicts in the Rio de la Plata basin, in the World Wars, at the end of the Military dictatorship and even today, as indicated by the current scenario. The advances in DLB capability are limited, or lost between one step and the next. As consequence, the DLB is not yet capable of designing and building the necessary facilities for the naval force, and equipping them with propulsion systems, weapons, sensors and communications systems designed and produced in the country.

The present moment suggests a context of reduced autonomy of the Forces, either due to the creation of the MD and Complementary Laws related to preparation and use, or by the National Defense

Strategy, which sets guidelines for the constitution of the Forces and links the construction of defense to the national development.

Administrative organizations have been created to develop defense logistics, such as SEPROD and CMID, but the lack of concentration of basic governance requirements on a single actor leads to inadequate management of the DLB. Therefore, the macrostructure of the Brazilian military capacity building should be revised, as has been done in other countries, like Sweden, France, the United Kingdom, and others.

In addition, the construction of military power, like most countries, should receive a separate treatment, protected from the difficulties and limitations of the Forces, with its own budget, (independent of foreign financing and free of contingencies) high in value at the governmental level.

The DLB still requires a long maturation time. Only with proper institutions and strong willpower, not allowing deviations from the proper course, its construction and support will be possible.

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