The Brazilian army's concept of transformation: technology and military change[1]

O conceito de transformação do exército brasileiro: tecnologia e mudança militar

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INTRODUCTION

Despite the importance of deep-rooted institutions, traditions, and culture, armed forces worldwide are subject to military change. As the character and conduct of war change in space and time, military institutions can adapt, modernize, or transform themselves to perform their missions better in times of war and peace. Modern military institutions face several incentives for change, such as budget restrictions, external shocks, or risks of military defeats. Therefore, an apparent paradox is created, represented by the tension between "military conservatism" and the demands for military change in the present century.

According to Farrell and Terriff (2002), evidence of military change among important armed forces was already visible at the beginning of the millennium. Unlike previous moments, when the emphasis was on preparing to deploy and fight in high-intensity conflict scenarios, military change in the 21st-century points to complex requirements for high and low technological demand missions. The centrality of information, pro-

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cessing capacity, and related technologies in support of military operations is a striking feature of the military profile of our time (Farrell and Terriff 2002; Sloan 2012).

Brazil suffers the effects of exogenous and endogenous pressures that could encourage military change. The change in the strategic environment and its impacts on Defense budgets, especially downwards, affected the planning of many Armed Forces in recent years (Shurkin 2013; Collins and Futter 2015). In several countries, budget limits and increased acquisition costs, technology development, and maintenance exert an endogenous pressure for change. In Brazil, a second domestic pressure arises: related to the country's public security crisis. This situation often leads to constant subsidiary and constabulary operations requests, notably law and order enforcement initiatives (Operações de Garantia da Lei e da Ordem, GLO). Regarding external pressures, Brazil does not participate in any formal military alliance nor is involved in any armed conflict abroad.

Since National Defense Strategy (NDS) publication in 2008, the Brazilian Army has sought to respond to the challenges of raising its standards as a fighting force of the 21st century. In several documents, the Brazilian Army recognized that Force adaptation or modernization alone would be insufficient to increase the levels of Brazilian military power. The answer to that problem was the Transformation process. Braço Forte Strategy, Proforça, and the Army's Strategic Projects were essential steps towards the desired military change. The technological dimension stands out as the main driver for change in those documents and projects. However, according to the literature (Boot 2005; Sloan 2008; Davis 2010), the organizational and doctrinal dimensions are more central to Military Transformation than technology. This mismatch highlights a possible problem of technological determinism in force development (Owens 1996; Krepinevich 1994; Collins and Futter 2015). Therefore, we ask: does the Brazilian Army's concept of Transformation express an understanding of Military Transformation, or does it fall into the trap of technological determinism? Rather than being interested in evaluating the Army's military change empirically, we are more concerned with the Brazilian Army's concept of Transformation, especially from 2008 to 2018. What does it understand as Transformation? How does the concept guide policy design? What are the flaws in the connection between the Transformation concept and Force Development?

Military change is the phenomenon studied in the paper. Following the conceptual literature debate (Farrell and Terriff 2002), we use Covarrubias (2007) parameters of adaptation, modernization, and transformation as forms of military change. With it, we bring the phenomena more closely

to the Brazilian case. Our methodology has a qualitative focus and uses a case study research design (George and Barnett 2005), in which the selected case is the Transformation process of the Brazilian Army. The study used a document analysis strategy named internal comparison criteria. This strategy compares the different described documents (their nature and objectives) confronting them with the conceptual background of the research topic. Qualitative sources were used, such as official Army documents and information on Strategic Projects.

LITERATURE REVIEW

Although the research problem consists of a case study focused on the Brazilian Army, the events studied here are part of a larger class of phenomena known as military change. According to Farrell and Terriff (2002), military change consists of changing the objectives, current strategies, and the structure of military organizations. The authors present three aspects that explain why armed forces experience a military change in the 21st century. The first is related to shifts in the strategic environment due to the end of the Cold War; the second connects its impacts on defense budgets and the following downsizing of most Western armed forces. The third factor is the increased pace of technological development and innovation and its impacts on revolutionary changes in modern military operations (Collins and Futter 2015).

Farrell and Terriff (2002) state that there are three primary sources of military change: cultural norms, politics, and new technologies. Central to our hypothesis, the third source relies on the explanatory power of new technologies as sources of military change. This assumption rests on the perception that technological developments and their impacts on organizational, strategic, and tactical adaptation are powerful drivers for change. The ability of technology to induct military change alone (technological determinism) puts it at odds with military conservatism. However, authors such as Farrell and Terriff (2002), Howard (2004), and Collins and Futter (2015) converge in observing that technology and its impacts on military change cannot occur without social mediation. For example, Howard (2004) considered that changes in the conduct of war are better explained by the interrelation between social and technological changes.[2]

Even though studies about military change appeared as early as the 1960s, it was in the 1980s that this debate gained momentum with the seminal work of Barry Posen (1986), with an emphasis on the study of doctrinal change (Grissom 2007; Griffin 2016). The debate gained traction within academia in the 1990s, primarily through the Military Revolution

concept. Following Krepinevich (1994), Military Revolution would be composed of technological change, systems development, operational innovation, and organizational adaptation elements. Krepinevich's perspective understands that military change fundamentally occurs through paradigmatic ruptures with revolutionary effects in the military. This type of military change is essential to understanding how the structuring of armed forces and the fulfillment of its missions take place.

According to Sloan (2008), the revolutionary perspective on military change explains how armed forces are sized, structured, and equipped to perform missions. It is possible to identify at least two policy agendas[3] in the past century. The first, developed by Soviet military planners, was triggered by discovering the gap between Western military technology vis-à-vis soviet technology. The former had a clear advantage in embedded electronics and communications; the latter had more quantity than quality. To solve this problem, Marshall Nicolai Orgakov argued for a Military-Technical Revolution (MTR) (Proença Junior, Diniz, and Raza 1999). Despite officially incorporating doctrine and organizations into its model, MTR's emphasis was primarily on technology. For example, Collins and Futter (2015) claim that the centrality of technology in the MTR is one of the aspects that differentiates it from the Revolution in Military Affairs (RMA). RMA, our second perspective on military change, was more sensitive to the relationship between technology and doctrine than MTR.

The second policy agenda, RMA, was formally developed between the 1980s and the 1990s. Defenders of RMA argued that the combination of new technologies, doctrine, and organizational changes would modify the conduct and characteristics of war in the future (Krepinevich 1994). While Krepinevich's approach to Military Revolution (1994) represented a historical interpretation of military change, the military planners who advocated RMA, like William J. Perry (1991) and Owens (1996), expected a process of paradigmatic rupture already ongoing in the 1990s. This rupture would be a product of combining a technology-doctrine-organization complex, emphasizing expeditionary operations capable of tactical and strategic mobility. One example of this paradigmatic shift was its effects on force development, mainly by changing the design of the armed forces in favor of lighter platforms (i.e., "brigadization"). In addition, other aspects were relevant, such as jointness (interoperability) and the substitution of a platform-centric force design for a network-centric.[4] They made it possible to consolidate profound organizational changes, such as adopting a highly professional and capable force (Sloan 2008; Collins and Futter 2015).

Table 1
Dimensions of military change in the RMA

Technology	Doctrine	Organizations
➢ Precision-Guided Munitions (PGMs). ➢ Intelligence Gathering, Surveillance, and Reconnaissance (ISR). ➢ Command, Control, Communications, Computing, and Intelligence Processing (C4I).	➢ Changes in the force structure. ➢ Lighter, more deployable armies: 1. Expeditionary. 2. Mobility. 3. Lighter platforms. ➢ Jointness	➢ Smaller Units ➢ More qualified and trained soldiers ➢ All volunteer or professional armies

Source: the authors, based on Sloan (2008).

Soviet MTR and American RMA were both policy agendas for military change. They were developed under the evaluation of the United States Armed Force's response to the "Vietnam syndrome" and the defense sector reform that resulted from it. Between the 1970s and 1980s, the United States underwent a technological, organizational, and doctrinal transition. In line with the Second Offset Strategy, the United States incorporated technologies linked to the C4ISR complex in its force design. In addition, a professional and volunteer force replaced conscription, and finally, the Airland Battle doctrine emerged.

However, how victory was achieved in the Gulf War (1990-1991) made RMA the leading example of military change. This conclusion was also present outside academic debates; in several countries, RMA was a fundamental framework for defense policies between the 1990s and 2000s (Collins and Futter 2015). In Brazil, the Army understands RMA as a concept that "expresses the multiplier effects on operational effectiveness of new [operational] concepts, capabilities, techniques, and military equipment" (Brasil 2010a, 46).

Despite considering changes in doctrine and organizational adaptation in its model, the essential variable in RMA is technology. According to Howard (2004), defenders of RMA focus more on technological aspects than on the societal dimension. Added to its inherent technological determinism, RMA was identified as anti-Clausewitzian[5] due to the technological promise to overcome the "fog of war" as well as "friction" on the battlefield (Proença Júnior, Diniz, and Raza 1999). However, as a political agenda for military change, Afghanistan and Iraq wars in the 2000s were the main obstacle for RMA. The belief in the technological imperative as the main factor to produce victory suffered setbacks when the insurgent

threat emerged in Iraq (Sloan 2012). The discomfort facing RMA took over defense planners in countries such as the United States (Davis 2010).

As a political agenda for military change focused on the United States and NATO, the prevalence of irregular war and counterinsurgency operations in the 2000s removed the RMA from public debate. Meanwhile, some features of the debate on RMA are still present in the United States Third Offset Strategy and its antagonists, such as Russia's military reform and China's military modernization (Collins and Futter 2015). Nevertheless, if RMA has fallen out of fashion, the concept has survived and evolved into a new political agenda called Military Transformation. While RMA saw military change as rapid, radical, and uncontrolled, Transformation embraced the idea of change as a process but with consequences of discontinuity (Sloan 2008). If in RMA the revolutionary change made previous competencies obsolete, Transformation would have the ability to maintain what works but still create new capabilities (Davis 2010). Transformation is based on the discontinuous increase in capability, whereas the RMA conceives discontinuous leaps in military effectiveness (Sloan 2008). Although technology is crucial to Transformation, doctrine and organizational adaptation play a central role in the concept.

According to Covarrubias (2007), aside from policy agendas such as RMA and Military Transformation, Military Modernization[6] emerged as another form of military change in the 21st century. Modernization is related to evolutionary changes and involves incremental improvements in the capabilities necessary to carry out missions already performed (Sloan 2008). The Brazilian Army understands modernization as the «process of improving organizational structures to incorporate capabilities, techniques, and equipment to improve their performance within established concepts» (Brasil 2010a, 46). On the other hand, Transformation involves the idea of acquiring new capabilities to carry out not only traditional missions but new ones. For the Brazilian Army, Transformation is,

> The process of developing and implementing new joint operational concepts and capabilities, changing readiness, employment, minds, equipment, and organizations to meet the operational demands of a continuously evolving environment. (Brasil 2010a, 46).

In summary, " while modernization improves the ability to perform missions according to existing standards, Transformation of military capabilities redefines standards" (Sloan 2008, 8). Though RMA presupposes rupture through revolution and Transformation proposes discontinuous increases in capacity, evolutionary change is Modernization fundamen-

tal featured. It involves incremental improvements that improve military structures already in operation (Andrews 1998).

Table 2
Comparison between Revolution, Modernization, and Military Transformation

	Revolution in Military Affairs	**Military Modernization**	**Military Transformation**
Pattern of change	Rupture	Incremental	Discontinuous increases in capability
Time / maturation	Finalistic	Process	Process
Ability to control change	Low (takes advantage of the conditions to carry out the revolution)	Medium (incremental evolution of capability in the technological, doctrinal, and organizational areas)	High (sequential planning of military change to achieve new force standards and build capabilities for new missions)
Main source of change	Technology	Technology and Organizations	Technology, Organizations, and Doctrine
Impact on missions	Creates new missions	To better perform already existing missions	Creates new missions
Changes in war	Nature	Conduct	Character and Conduct

Source: the authors, based on: Proença Júnior, Diniz, and Raza (1999), Covarrubias (2007), Sloan (2008), Davis (2010), Collins and Futter (2015).

As some historical events testify, the Brazilian Army is not unfamiliar with Military Change. Moments such as the French Military Mission of 1919, the participation of the Brazilian Expeditionary Force in World War 2, the military reform of Castelo Branco in the 1960s, and the organizational changes exemplified by FT-90 and FT-2000 (Silva 2013) support this argument. The Army's desire for Military Transformation is a product of the perception that military power became more complex and fungible in the post-Cold War period. Nowadays, the Army faces two main challenges. First, to carry out its Transformation process to achieve the

warfighting requirements of the Knowledge Age.[7] Secondly, to be capable of operating more and more in Full Spectrum Operations. These challenges go beyond military modernization.

MILITARY TRANSFORMATION IN THE ARMY'S DOCUMENTS AND PROJECTS

The 2008 National Defense Strategy publication was a paradigmatic event for developing Brazilian military policy initiatives. That can be said because,

> For the first time, the political power has taken upon itself the responsibility of defining the parameters that will guide the evolution of the military in the context of the national defense structure. This places on the Forces renewed attributions, especially in presenting plans with the capacity to support and motivate political and economic decisions by the Federal Government. (Brasil 2010a, 20).

Since the strategic guidelines demanded force design, systems, and platform changes, the Army developed the Braço Forte Strategy (Brasil 2010a, 20) in response. From the NDS, the Brazilian Army gave the initial impetus to its process of military change, named Transformation. The urgent need to increase the Army's operational capabilities was addressed by NDS vis-à-vis a new role: the ability to support foreign policy.

Regardless of talking about Transformation, for the most part, the NDS deals with ways to better fulfill existing missions. The kind of military change proposed by the NDS is best characterized not as Transformation but as modernization. The NDS consisted of an ambitious military modernization program. Its objectives were to improve the capacity to monitor the terrestrial, maritime, and aerospace environment, increase strategic mobility, and, especially, the nuclear, cyber, and space sectors (Brasil 2008). Assignments and missions were already on the list of those performed by the Army at the time. An important exception was the Army's role in cyber defense. The strategic emphasis on the Amazon was strengthened, resulting in the orientation for re-equipment and organizational change to meet the region's security challenges. The reorganization and re-equipment of military units to increase deterrence, flexibility, modularity, and interoperability took place. Highlighting the emphasis on modernizing rather than Transformation, we emphasize among those objectives the promotion of technology and training to develop the country's defense industrial base. Economic and technological development was the central axis of the Strategy rather than transforming the armed forces.

Two international events triggered a military change in Brazil. First, there was a shared understanding that the country's condition as a rising power and international prestige would demand an increase in military capabilities to support Brazil's political and strategic goals. Another explanatory factor for the urgency of the process understood by the Brazilian Army as Transformation dealt with the impact of the Brazilian leadership in Minustah.[8] According to an assessment by the Army General Staff,

> The crisis in Haiti highlighted the limited capacity of the Ground Forces to project force and to face contingency situations, which could have jeopardized our ability to maintain a leading role among the other countries present there [...]. (Brasil 2010a, 17).

It is possible to identify other factors that triggered military change at the domestic level. The growing political demand for Law-and-Order Operations added to the pressing challenges of adapting the Force to the budgetary constraints. In the face of external and internal stimuli mentioned above, the Brazilian Army was experiencing severe problems of obsolescence and the need to regain operational capacity. NDS was a window of opportunity for military change, whose central focus was to perform the transition to a more modern military force. As demonstrated in Table 3, a collection of documents oriented the Army's Transformation process.

Table 3
The Army's Transformation Concept through Analyzed Documents

ID	Document	Publication Year	Issuing Body	Guideline
1	*National Defense Strategy*	2008	Ministry of Defense	Strategic
2	*The Army's Transformation Process*	May 10, 2010	Brazilian Army	Policy
3	Ordinance No. 075-EME. Army Bulletin No. 24	June 10, 2010	Army General Staff	Implementation
4	*Brazilian Army Force Project – Proforça (extract)*	2012	Brazilian Army	Force Project
5	*Bases for the Transformation of Terrestrial Military Doctrine — Ordinance No. 197-EME*	September 26, 2013	Army General Staff	Doctrine

6	*Conception of Transformation of the Army (2013 — 2022). Ordinance No. 1253*	December 05, 2013	Commander's Office (Army)	Policy Concept
7	*Army Capabilities Catalog* – Ordinance no. 309-EME	January 2, 2015	Army General Staff	Capabilities
8	*Integrated Border Protection Program – PPIF.*	Decree No. 8.903, of November 16, 2016	Presidency of the Republic	Policy
9	*Army Strategic Portfolio – Army Project Office*	2018	Army Project Office (EPEx)	Capabilities

Source: the authors.

The document called "The Army's Transformation Process" was launched in May 2010 (Brasil 2010a). Among the arguments that justified a military change, we highlight the objective of increasing the Army's capabilities to support Brazil's international power projection. A military change was needed because "The solution to the need to keep the Army's readiness and employment ahead of the new challenges is found in the concept of transformation, as it requires the development of new capabilities to fulfill new missions." [emphasis added] (Brasil 2010a, 9).

According to the Army's General Staff (Brasil 2010a, 10), the "points that mark a transformation" could be summarized as a transition from the peace structure to war; 'operational compression'; interoperability, and development of weapons systems and information management. Covarrubias (2007) directly inspired the Brazilian Army's concept of Transformation. In his view, there would be three distinct types of military change: adaptation, modernization, and Transformation. Although Covarrubias (2007) did not differentiate policy agendas from the actual phenomena of military change, the Brazilian Army used his typology to reflect upon its evolutionary process.

Because of its connection to Covarrubias, the Chilean and Spanish experiences inspired the Army's understanding of Transformation. While those experiences of military change may be engaging, to model the Brazilian Army's Transformation policy upon them is questionable. Chile has armed forces strongly oriented towards external defense, endowed with stable resources to acquire, and modernize equipment, and does not have Brazil's density and strategic depth (i.e., territory). NATO strongly influences Spain's force structure, fostering its military change.

Spain must follow doctrinal uniformity and equipment and demands for combined operations from NATO. Its expeditionary profile is mandatory because it participates in the military alliance.

What the Brazilian Army learned from the Chilean and Spanish experiences can be summarized as follows: Transformation as a response to changing realities (political and strategic); the importance of rationalization of "operational structures"; "Management modernization," and the "search for administrative rationalization"; doctrine as an "engine of transformation"; interoperability; "Decrease in the level at which the integration of weapons systems will take place"; joint logistics; adoption of modern equipment and development in S&T followed by a reduction in manpower; inclusion of peace operations "in the set of the main missions of the armies of the future; [and] investment and development in human resources." (Brasil 2010a, 16).

Based on the evaluations and diagnoses of the General Staff, "The Army's Transformation Process" (Brasil 2010a) presents what the institution understands by Transformation:

> The concept of Transformation emerged in the 1970s from the discussion on Evolution in Military Affairs (EMA) and Revolution in Military Affairs (RMA), combining the dynamics of gradual progress with the need to periodically break paradigms in the search for full capacity to overcome opponents and fulfill missions. With the emergence of new technologies related to data processing and transmission, robotics, and weapons systems, the tendency has become established to systematize the actions necessary for the military use of these potential advantages through the transformation process. Information technology, cybernetics, space, and nuclear capabilities, nanotechnology, robotics, C4ISR, biotechnology, are some of the parameters that military forces are facing in current conflicts and those envisioned for the future. (Brasil 2010a, 10).

Although Chilean and Spanish experiences demonstrated the centrality of organizational and doctrinal change, the Brazilian Army's understanding of Transformation emphasizes the duality between missions and capabilities. This focus led to perceiving technology and its effects as enhancers of military performance. Here Transformation is conceived in a reductionist manner, linked to a perspective that sees technology as inducing military change. It is noteworthy that the Army's institutional understanding of military Transformation is remarkably close to what Sloan (2008) calls the RMA-focused approach. June 2010 Ordinance No. 075 of the Army's General Staff supports this interpretation. The mentioned document approved the guideline for implementing the Transformation

process of the Brazilian Army (Brasil 2010b). We highlight the following objectives: "a. Promote the transformation of the Army, bringing it from a conception linked to the industrial era to the era of knowledge" and "b. Provide the Army with the development of the capabilities required by the evolution of Brazil's political and strategic stature" (Brasil 2010b, 1-2).

Among its results, in 2012, Proforça was published (Brasil 2012). This project was based on the NDS (Brasil 2008) and reflected the first versions of the Army's Transformation Concept. Through the Braço Forte Strategy,[9] the Army's tried to answer the demands for modernization of the NDS (Brasil 2008). According to Proforça,

> The new capabilities to be acquired and the strategies to be adopted will provide the necessary strategic leap. It must be consolidated into a force project that establishes military requirements (capabilities) and proposes Force arrangements (organizational structure, articulation, equipment, logistics, and readiness), considering budgetary limitations. (Brasil 2012, 3).

According to the Force Project, the evolution of armed conflicts would lead to changes in strategy, mainly due to the needed ability to engage in high-intensity wars fought with high-tech military equipment and asymmetric and irregular wars (Brasil 2012).

Followed by the Braço Forte Strategy and Proforça, 2013 saw the publishing of the "Basis for the Transformation of Terrestrial Military Doctrine" (Brasil 2013a). This document "intends to guide the introduction of doctrinal concepts and concepts to incorporate, in the Ground Forces, the capacities and skills necessary for their use in the Knowledge Age" (Brasil 2013a, 7). The implications of this document for the ground forces can be summarized as follows:

> 2.2.1 Consistent with the operational environment, the Army's Transformation Process aims to provide the Force with new skills and capabilities, to prepare its troops to fulfill missions and tasks in the Knowledge Age. The attainment of these competencies and capabilities is essential for a Ground Force to act in the entire Spectrum of Conflict, achieving the deterrent effect that a country's Armed Forces must-have. [emphasis added] (Brasil 2013a, 12).

Presented as a "guiding document for the Transformation Process of the Brazilian Army," the "Army Transformation Concept (2013-2022)" was also published in 2013 (Brasil 2013b, 8). The document consolidates the understanding, consistent with the canonical view in literature, that Transformation consists of developing new capacities to fulfill new missions in peace or war. By "new," this concept means changing the Army in-

to a force based on the "Knowledge Age." An aspect that stands out to this end is the "Transformation inducers."[10] Although the "Transformation inducers" are based on capabilities, they are usually associated with strategic projects and programs focused mainly on equipment. The Army Capacities Catalog (Brasil 2015) states that "Operational Capabilities (OC)",[11]

> [...] is the ability required of a military force or organization to obtain a strategic, operational, or tactical effect. It is obtained from seven determining, interrelated, and inseparable factors: Doctrine, Organization (and/or processes), Training, Material, Education, Personnel, and Infrastructure — which form the acronym Doamepi. (Brasil 2015, 7).

This definition is helpful to illustrate how the prioritized programs and projects for the Army Transformation process are based mainly on the technological pillar. Despite the idea that capabilities have several dimensions, as the organizational and doctrinal ones, technology is seen as the main driver for military change. For example, "The Braço Forte Strategy, in its main structure, consisted of 823 projects organized into four major programs, to be deployed in the short, medium, and long terms (2014 — 2022 — 2030)" (Brasil 2010a, 43). Of the two programs in this Strategy, the "Protected Amazon Program" stood out for implementing Sisfron,[12] the restructuring of the Jungle Brigades, and the modernization of operating systems. The "Sentinela da Pátria Program" focused on restructuring Brigades and Military Area Commands (Brasil 2010a, 43).

As demonstrated in Table 4, the same emphasis on technology as inducing Transformation is seen in the EPEx (Army Project Office) Strategic Programs: Sisfron, Proteger, Astros 2020 (Cruise Missile — MTC 300), Guarani, Proteger, Cyber Defense, Army Aviation, and Air Defense. In the Army's Strategic Portfolio context, the programs considered "inducers of transformation" are in the sub-portfolio "Defense of Society." Using the analytical tools displayed in Table 2 (Comparison between Revolution, Modernization, and Military Transformation), Table 4 presents the description and categorization of the programs in the sub-Portfolio mentioned above.

Table 4
Sub-Portfolio "Defense of Society" (Strategic Portfolio of The Army).

Programs	Description	Mission	Military Change
ASTROS 2020 / Cruise Missile (MTC 300)	"The ASTROS 2020 Program aims to equip the Ground Forces with high aggregate technology rockets and missiles Artillery system capable of targeting between 15 and 300 km from the platforms of the ASTROS System vehicles. Beginning in 2012 and expected to finish in 2023, the Program includes research and development projects, the acquisition and modernization of vehicles of the ASTROS System, and the construction of installations of Military Units." / "Development of MTC 300 for the ASTROS System, attending to selective lethality and protection concepts, delivering Defense Products (PRODE) of high technological value."	New	Transformation
Army Aviation	"The Army Aviation Program aims to equip the Land Force with modern and effective combat capabilities. In order to do so, a wide spectrum of actions was planned to maintain the Army Aviation as a vector of modernity and operational efficiency, providing the Brazilian Army with the best conditions to accomplish its missions [...]."	Old	Modernization
Air Defense	"The Strategic Program of the Antiaircraft Defense [Air Defense] (Prg EE DAAe) aims to recover and obtain the capacity of the Low and Medium-Level Anti-Aircraft Operational System, respectively, to allow the protection of the Brazilian terrestrial strategic structures, the sensitive areas, and the Land Force, when in use."	Old	Modernization

Cyber Defense Program in The National Defense	"The purpose of this program is to increase training, doctrine, science, technology and innovation, intelligence, and operational activities within the scope of National Defense. Through coordination and systemic integration by the Ministry of Defense (MD) and the Armed Forces, to jointly ensure the effective use of cyberspace (preparation and operational employment), to prevent or hinder their use against national interests."	New	Transformation
Cybernetic Defense Program	"Integrated into the Cybernetic Defense Program in National Defense, the Army develops its Strategic Cybernetic Defense Program, whose purpose is to coordinate and integrate the projects and processes of the cybernetic sector and develop the cybernetic capabilities of the Ground Forces."	New	Transformation
Guarani	"The Strategic Program Guarani aims to transform the Motorized Infantry into Mechanized and modernize the Mechanized Cavalry, retaking the capacity of the Brazilian Defense Industrial Base by manufacturing in the national territory of most of the means. It provides technological and quality advances, through technology transfer and technical qualification of national labor, contributing to the generation of jobs and revenue."	Old	Modernization
OCOP	"The Obtainment of Full Operational Capacity Strategic Program (OCOP) aims the recovery and the obtaining of new capabilities to the Land Force (F Ter) by replacing Military Employment Systems and Materials (SMEM) with technology lag or at the end of its life cycle, by increasing logistic interoperability among the Forces, by improving individual and collective equipment of combatants and by the effectiveness of the logistical support of military land forces."	Old	Modernization

PROTEGER	"The Strategic Program Protection of Society (Prg EE Proteger) is a complex system aimed at increasing the capacity of the Brazilian Army to coordinate operations in the protection of society. It has a special emphasis on protecting Terrestrial Strategic Structures (Critical Infrastructures) in a crisis. It supports civil defense in natural or manmade disasters, including in areas contaminated by chemical, biological, radiological, and nuclear agents. coordination of security and performance in Major Events; execution of Law-and-Order Enforcement (GLO) operations and Guarantee of Voting and Vote Counting (GVA) in electoral suits; and actions to prevent and combat terrorism, when requested by the federal government, among other subsidiary operations."	Old	Modernization
SISFRON	"The Integrated Border Monitoring System (Sisfron) aims to the implementation of a system which enhances the presence of the Brazilian State in the land border strip. It aims to enhance government agencies' actions through monitoring equipment, decision-making support, and operational employment in conjunction with the Integrated Border Monitoring Program (Decree 8,903, November 16th, 2016)."	New	Transformation

Source: the authors, based on "Army Strategic Porfolio" (Brasil 2018, 8, 12, 16, 20, 24, 26, 30, 34-35, 38).

Designed to achieve strategic autonomy and develop the defense industrial base, the programs incorporated domestic production or the participation of Brazilian companies in the development and defense products into their design. However, the deadline for the portfolio product's completion and delivery has undergone substantial adjustments due to the wake of the economic crisis experienced by the country.

The pace of acquisitions and committed funds into strategic programs have been affected by the deterioration of economic conditions since 2011 (IISS 2017). In 2015, for example, about 24% of the defense portfolio's budget for acquisitions was cut[13] (IISS 2015, 371-2). In the same year, funds for acquisitions for the Army were about 56% below what was necessary, according to the Force Commander (IISS 2015, 368). The budget

allocated to SISFRON, for example, suffered cuts of 42% in 2015. The reduction of resources available for Defense persisted in the change of government from Rousseff to Temer; in 2017, around 30% of the budget for military acquisitions was reduced, leading to the delay of several programs (IISS 2018, 377).

Given the described budgetary constraints, the Army's acquisition profile of major weapons systems between 2009 and 2018 illustrates the predominance of a modernizing emphasis at the expense of Transformation. When debating the major Army programs, expressions such as "modernization," "restructuring," "completing," and "equipping" highlights how the prolonged material obsolescence induced a focus on the technology and equipment. It is representative of what the Army perceives to be Transformation.

Table 5
Arms Transfer to the Brazilian Army (2009 to 2018)[14]

Supplier	Weapon designation	Weapon description	Year of delivery	No. delivered
France	EC725 Super Cougar	Transport helicopter	2010-2019	(36)
Germany	BPz-2	ARV	2009	7
	BrPz-1 Biber	ABL	2009	4
	Leopard-1A5	Tank	2009-2012	(220)
	Leopard-1 chassis	Tank chassis	2009	(4)
	PiPz-2 Dachs	AEV	2009	4
	BPz-2	ARV	2012	2
	BrPz-1 Biber	ABL	2012	1
	PiPz-2 Dachs	AEV	2012	1
	Gepard	SPAAG	2013-2015	(34)
Israel	UT-25/UT-30	IFV turret	2014-2019	(60)
Italy	VBTP Guarani	APC	2012-2019	(404)
	LMV	APV	2018	16
Russia	Igla-S/SA-24	Portable SAM	2010-2012	(300)
	Igla-S/SA-24	Portable SAM	2015-2016	(130)
Sweden	RBS-70 Mk-3 Bolide	Portable SAM	2014-2017	(80)
Switzerland	Fieldguard-3	Fire control radar	2014-2019	(6)

United States	C-7	Diesel engine	2013-2014	(30)
	S-70/UH-60L	Helicopter	2011	(4)
	S-70/UH-60L	Helicopter	2012	(6)
	6V-53	Diesel engine	2013-2015	(150)
	M-109A5 155mm	Self-propelled gun	2015	4
	6V-53	Diesel engine	2017-2019	(236)
	M-113	APC	2016	46
	M-88	ARV	2016	4
	109A5 155mm	Self-propelled gun	2018	36
	M-992 FAASV	ALV	2018	40

Source: SIPRI (2020). Trade Registers Search Parameters. Suppliers: France, Germany, Israel, Italy, Russia, Sweden, Switzerland, United States. Recipient: Brazil. From 2000 to 2018. Weapons systems: All.

Initiatives such as the "Army's Strategic Project for the Recovery of Operational Capacity" (PEE RECOP) illustrate the concern with the modernization and recomposition of capacities. Nonetheless, using the Transformation vocabulary, the "three Basic Assumptions [that] will condition the transformation" consist of improving what is already in the mission: valuing conscription, maintaining the Presence Strategy, and preserving the values and traditions of the Army. (Brasil 2010a).

While the external impetus for Transformation stressed the need to create power projection capacities, in Brazil, military conservatism led the Army's adaptation and modernization to fulfill missions other than war. From 2010 to 2018, the demand for force in internal security and public security operations increased. As seen in the 2011 "Strategic Border Plan"[15] (IISS 2014), instead of emphasizing the western and northern borders from the perspective of "new missions," border surveillance and monitoring were performed within the scope of subsidiary and constabulary missions. In addition, organizational changes, such as the dismemberment of the Military Command of the Amazon to the Military North Command, meet mainly the requirements for fostering law-enforcement capabilities rather than transforming the Army into a force of the Knowledge Age.

FINAL REMARKS

Since the publication of the 2008 NDS, the Brazilian Army has dealt with issues related to technology innovation, doctrinal change, and or-

ganizational adaptation. However, as can be understood in the documents that guided the process of military change, the weight of technology prevails. The concern with replacing obsolete equipment and recovery of operational capacity affects the process of military change, leading to modernization, not Transformation. In that sense, it is possible to identify a technological determinism in the Army's concept of Transformation.

Although it is possible to list several initiatives for re-equipping and reorganizing the Army, the search for technological improvement prevailed. The belief in the connection between defense and economic development reinforced this approach. Although necessary, the focus on technology related to strategic autonomy has removed the Army from the urgency to provide the Ground Forces with operational readiness and more modern capabilities. While the relationship between new capabilities and new missions is present in the analyzed documents, there are no new mission areas. As table 4 demonstrated, there are some exceptions to this, such as the Army's role in Cyber Defense, SISFRON, and the strategic implication of the ASTROS 2020 (Cruise Missile — MTC 300) program.

Technology was the Army's concept of Transformation essential concern. The doctrine was itself a product of the Transformation process. In 2013 "Bases for Transformation of Terrestrial Military Doctrine" and 2017, "Army Strategic Concept," both part of SIPLEx (Army Planning System), discussed this idea. The Army's Transformation process highlights its modernizing feature when confronting the Ground Forces doctrine to the platforms planned in the strategic programs.

The organizational dimension received a marginal emphasis in the analyzed documents. This problem is not a minor issue. In contexts of severe budget constraints, organizational change can provide answers to problems, helping create adequate conditions for Transformation. Countries such as the United States, China, and Russia carried out profound organizational change processes to enable transformation's technological and doctrinal dimensions Those were implemented by downsizing, professionalization, and rationalization, among other policies.

Except for Cyber Defense, SISFRON, and ASTROS 2020 (Cruise Missile — MTC 300), we conclude that, despite using the term Transformation, the assumptions that support the Army's Transformation process predominantly imply improving what is already done. The main policy agenda of military change found in the analysis is neither Transformation nor Revolution in Military Affairs but modernization.

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NOTAS

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2. An example is the emergence of state bureaucracies and nationalism in conjunction with the steam engine and telegraphs.
3. Military-Technical Revolution and Revolution in Military Affairs are more policy agendas than clear perspectives on military change. It is possible to organize actual perspectives in three sub-areas of analysis: 1. Military Adaptation, 2. Military Innovation, 3. Military Emulation) or approaches to analysis (culturalist, inter-force, extra-force, realist) (Grissom 2007; Griffin 2016).
4. See Network-Centric Warfare (Sloan 2012).
5. In Clausewitz's (1984) theory of war, both "fog of war" and "friction" are vital components of what he called "real war." It would be possible to reduce its effects, but not even technology could fully overcome them.
6. Despite holding different understandings about concepts such as adaptation, innovation, and emulation/diffusion (Grissom 2007; Griffin 2016), Covarrubias's (2007) typology of military change has the advantage of bringing the phenomena more closely to the Brazilian case. Covarrubias's writings directly influenced the Brazilian Army's Military Transformation.
7. Although the expression "Information Age" is prevalent in US and NATO policy documents, Brazilian Army documents prefer the usage of "Knowledge Age," with similar meaning.
8. Mission des Nations Unies pour la Stabilisation en Haïti.
9. The BRAÇO FORTE Strategy was "made up of 02 (two) Plans – Articulation and Equipment – deployed in 04 (four) Programs – Protected Amazon and Sentinela da Pátria Program (Articulation); and Strategic Mobility and Brazilian Combatant (Equipment) – from which derived 824 projects" (Brasil 2012, 12).
10. The drivers of Transformation are fundamentally related to strategic programs and projects capable of advancing the Transformation process. The "Transformation Vectors" are of a broader order, transcending the technological dimension. They are Doctrine; Preparation and Employment; Education and Culture; Human resource Management; Current and Strategic Management, S&T and Material Modernization; Logistics" (Brasil 2010a, 31).
11. We suggest reading the Ground Military Capabilities and Operative Capabilities list (Brazil 2015, 21).
12. Sistema Integrado de Monitoramento de Fronteira.

13. However, we emphasize that the Brazilian budget is not small but strongly impacted by military social security expenditures.
14. We selected only acquisitions after the publication of the 2008 National Defense Strategy.
15. In 2016, the Strategic Border Plan was replaced by President Michel Temer's "Integrated Border Protection Program" (Brasil 2018).

THE BRAZILIAN ARMY'S CONCEPT OF TRANSFORMATION: TECHNOLOGY AND MILITARY CHANGE

ABSTRACT

Since the National Defense Strategy (NDS) publication, the Brazilian Army has sought to respond to the challenges of raising its standards to those of the Knowledge Age. Braço Forte Strategy, Proforça, and the Army's Strategic Projects are examples of necessary steps towards the desired military change. However, does the Army's concept of Transformation express an understanding of Military Transformation, or does it fall into the trap of technological determinism? Our hypothesis states that possible failures of the Army's Force Project are a product of a reductionist understanding of Transformation. Despite using the term Transformation, the assumptions that support the Army's Transformation process predominantly imply improving what it already does. Excepting projects such as Cyber Defense, SISFRON, and ASTROS 2020, modernization is more present than Transformation as military change. The paper used a Case Study research design methodology. Qualitative sources such as documents from the Ministry of Defense and the Brazilian Army were analyzed using a document analysis strategy named internal comparison criteria.

Keywords: Military Change. Military Transformation. Technology. Brazilian Army.

RESUMO

Desde a publicação da Estratégia Nacional de Defesa (END), o Exército Brasileiro buscou responder aos desafios de elevar seus padrões para o patamar da Era do Conhecimento. A Estratégia Braço Forte, o Proforça e os Projetos Estratégicos do Exército são exemplos de passos necessários para a mudança militar desejada. Entretanto, a concepção de Transformação do Exército expressa um entendimento sobre Transformação Militar ou incorre na armadilha do determinismo tecnológico? Nossa hipótese afirma que as possíveis falhas do Projeto de Forças do Exército são produto de um entendimento reducionista da Transformação. Apesar de usar o termo Transformação, as suposições que apoiam o processo de Transformação do Exército implicam predominantemente em melhorar o que já é feito. Com a exceção de projetos como a Defesa Cibernética, SISFRON e ASTROS 2020 (Míssil de Cruzeiro – MTC 300), como mudança militar, a modernização está mais presente do que a Transformação. O artigo utilizou a metodologia do desenho de pesquisa de Estudo de Caso. Fontes qualitativas, como documentos do Ministério da Defesa e do Exército Brasileiro, foram analisadas utilizando a estratégia de análise de documentos denominada de critérios de comparação interna.

Palavras-chave: Mudança Militar. Transformação Militar. Tecnologia. Exército Brasileiro.

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