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Creation and Development of the Simulation Division: Innovation, Safety and Impact International Relations in Brazilian Military Training

Creation and Development of the Simulation Division: Innovation, Safety and International Impact on Brazilian Military Training

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Summary

This article investigates the impact of the creation and implementation of an unprecedented project in Brazil, led by Army Captain George Eduardo de Sousa Lopes, which revolutionized the way the Brazilian Armed Forces are trained and established Brazil as a regional and international reference in combat training and preparation through simulation systems. Initially, the article presents the limitations in training for various military activities due to the high associated financial cost and how this could be overcome by developing a unique and revolutionary system. The advantages of using simulation techniques are presented, both in terms of the exponential increase in troop safety and capabilities, and the millions of dollars in savings generated for the Armed Forces and for Brazil. The systems that comprise the advanced simulation training system, called the "Simulation Division," are briefly listed. The article presents research conducted with members of the Armed Forces evaluating the revolutionary impact of applying the simulation system and the new military doctrine to training. Finally, the research shows that simulators have been identified as essential tools for safe and effective training. Furthermore, the savings generated by the simulators are in the millions, allowing Brazil to direct the saved resources to other military areas, thus strengthening the Brazilian defense system.

Keywords: Simulators, Security, Military Training.

Abstract

This article investigates the impact of the creation and implementation of an unprecedented Project in Brazil, led by Army Captain George Eduardo de Sousa Lopes, which revolutionized the training methods of the Brazilian Armed Forces and established Brazil as a regional and international reference in combat training and preparation through simulation systems. Initially, the article highlights the financial limitations and high costs associated with training various military activities and how this could be overcome by the development of a unique and revolutionary system. It presents the advantages of using simulation techniques, whether through the exponential increase in troop safety and capacity building, or through the millions in savings generated for the Armed Forces and for Brazil. The article briefly lists the systems that comprise the advanced simulation training system, called the "Simulation Division." A survey conducted with members of the Armed Forces is presented, evaluating the revolutionary impact of applying the simulation system and the new military doctrine in training. Finally, through the research, it is possible to verify that the simulators were identified as essential tools for safe and effective training. In addition, the savings generated by the simulations are in the order of millions, allowing Brazil to direct the saved resources to other military areas, and thus, strengthen the Brazilian defense system.

Keywords: Simulators, Safety, Military Training.

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Introduction

The purpose of this paper is to present the Advanced Training Center Project, known as the "Simulation Division," and to verify the positive impacts for the Brazilian Armed Forces of the project developed and led by Captain George Lopes.

The idea for creating this advanced training system originated from Captain Lopes' identification of a lack of available military equipment to fulfill all planned training objectives.

In this context, the possibility of developing a pioneering and unprecedented system and doctrine in Latin America was verified, with the potential to exponentially increase the capabilities of the Brazilian Armed Forces and position Brazil as a benchmark in simulated training at the regional level within Latin America, and as a benchmark at the international level.

The first step was to identify needs and ideas for the development of such tools. Following this, under the responsibility of Captain Lopes, negotiations began with international companies capable of supplying integrated high-technology equipment. Several meetings were held, and the following was reached...

conclusion regarding the best equipment to be acquired and developed.

All phases involved a great deal of effort and resilience on the part of those responsible for the project, in order to convince the authorities of the importance of investing in such high-value integrated equipment. The main point defended was that the application of simulation techniques and the use of simulators demonstrate an improvement in the pace of the teaching and learning process. Furthermore, the simulators promote savings of millions of dollars for the Brazilian Army, as can be verified in the Economic Feasibility report:

> The expectation is that, with the full implementation of the Simulation Division, the Army will save more than **R$10,000,000.00 (US$1,800,000.00) annually, and over a projected 10-year period, the savings will exceed R$100,000,000.00 (US$25,341,476.00).** This saving will result mainly from the partial replacement of real-world training with high-fidelity digital simulations, with lower operational and logistical costs.
> (LOPES, 2019)

The constant limitations of various kinds experienced by most armies today, such as resource limitations, personnel limitations, and material limitations, impose the need for rationalization and sustainable use of existing resources.

According to definitions of its best use (NUNES, 2013, p.9), the use of modern technologies has been increasingly employed, with simulation being an increasingly viable approach, as it allows for an increase in the quantity and quality of teaching, instruction and training, without wearing out real equipment; it allows for the assessment of performance; it allows for the gathering of lessons regarding the use of weapons systems, units and their respective support, and the training of General Staffs without the need to employ troops in the field, all with reduced cost and exercise time.

Beyond the financial factor, the use of simulators in military activity can directly contribute to **increased safety for the military personnel involved,** given that, at a relatively low cost, it is possible to train essential procedures that will later be used in combat situations. Regarding this, one of the definitions of the function of using simulators can be cited:

"The main objective of simulation is to **reduce the risks** associated with a specific action, whether those risks are financial, human, or of any other nature." (NUNES, 2013, p.20)

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For this reason, **resources that enhance security and facilitate the accomplishment of the troops' mission are valuable and can decisively contribute to troop deployment.**

This study aims to evaluate the impact of implementing the Simulated Training System, known as the *"Simulation Division,"* and its direct consequences on the safety, capability, and subsequent success of missions carried out by the Brazilian Army.

We also aim to present advanced training systems, as well as...
doctrinal impact generated after its implementation.

1. The importance of an advanced military simulation training system

In a military activity, troops lack a high level of training.
(BRAZIL, 2016). Activities such as shooting, combat tactics training, and mission planning need to be exhaustively rehearsed.

All of these training exercises, when conducted using real resources—aircraft, ammunition, transportation, per diem, and other factors—are extremely expensive, which hinders **and** sometimes prevents the execution of the training.

2. Identifying the problem and assessing the needs to meet the demands.

Faced with budgetary difficulties and limitations in carrying out fundamental training for troop readiness and preparedness, a study coordinated by Captain George Lopes was conducted to define the needs and opportunities for improving the training system, as well as the acquisition of equipment that would contribute to improving the operational capacity of the Brazilian Army (LOPES, 2019).

The tools available in the simulators allow the military to get closer to
In reality, this allows him to connect the theoretical ideas before carrying out the mission.

In this context, simulators **have the necessary potential to support troop training and guide them in developing skills that will guide their deployment, increasing the level of safety, contributing to the success of operations, and reducing accidents.**

After extensive study, the following activities were identified as most beneficial to the advanced simulation training system: simulated shooting training, with real-life situations involving victims under the control of kidnappers; training involving the use of military activities with parachutes, such as navigation, freefall, coordination between members of the same team performing a parachute infiltration, and various other activities that comprise this process. In addition, the need for simulated personnel deployment training was identified, with the actual mission terrain projected onto the ground and the aircraft structure identical to that used by troops. Furthermore, cargo drop training systems were also identified, where various factors and risks are involved. (LOPES, 2018).

To support the decision-making process, Captain George Lopes prepared a feasibility study for the creation of this simulation system, addressing the economic impact generated for Brazil. This study demonstrated that savings will be achieved.
annually amounts exceeding **R$10,000,000.00 (US$1,800,000.00)** and over a period of time.
Projected savings over 10 years exceed R$ 100,000,000.00 (US$ 25,341,476.00). This saving will result mainly from the partial replacement of real-world training with high-fidelity digital simulations, with lower operational and logistical costs. (LOPES, 2019)

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Annual Economy		
Spent	**Annual savings (R$)**	**Annual savings (US$)**
Reduction in flight hours	R$ 3,000,000	US$ 760,244
Aircraft maintenance	R$ 2,500,000	US$ 633,537
Financial rewards and logistical support	R$ 2,000,000	US$ 506,830
Replacement of materials/equipment. Total	R$ 2,500,000	US$ 633,537
savings: R$ 10,000,000 US$ 2,534,148		

Figure 1: Projection of the savings generated by the implementation of the Simulation Division Project.
Source: LOPES, 2018

Projected economy over 10 years		
Spent	**10-Year Projection (R$)**	**10-Year Projection (US$)**
Reduction in flight hours	R$ 30,000,000	US$ 7,602,443
Aircraft maintenance	R$ 25,000,000	US$ 6,335,369
Financial rewards and logistical support	R$ 20,000,000	US$ 5,068,295
Replacement of materials/equipment	R$ 25,000,000	US$ 6,335,369
Total economy	**R$ 100,000,000 US$ 25,341,476**	

Figure 2: Projection of the savings generated by the implementation of the Simulation Division Project.
Source: LOPES, 2018.

3. Development of an unprecedented Military Doctrine in Brazil

Following research and implementation of the training system, Captain George Lopes led the creation of an innovative simulated training doctrine. This unique contribution in Latin America elevates Brazil as a global benchmark in combat preparedness, with international recognition for its impact.

Innovations in Doctrine

Counter-Terrorism Operations: Simulations focus on hostage rescues, using shooting simulators for quick decisions in real urban scenarios, improving accuracy and reducing fatal errors.

Training for Major Events: Preparing troops for events such as the Olympic Games. Simulating threats in crowds and asymmetrical responses, ensuring maximum security.

Border and Jungle Operations: Integrates variables such as uneven terrain and nighttime conditions into navigation simulators for safe infiltration into complex areas.

Special Forces Operations: Exercises for commando and special forces troops. These include free falls and cargo drops, shooting in various critical situations, with training under pressure and critical failure response.

Revolutionary Impacts

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Accident Reduction: Up to 30% reduction in injuries in real-life situations, through safe simulations that allow for repetitions without real risks.
High-impact cost savings: Annual savings exceeding R$10 million in flights, maintenance, and logistics, redirecting resources towards operational modernizations.
International Influence: Several allied nations sent delegations to study the system created in Brazil in recognition of the innovative leadership and originality of the project.

(LOPES, 2019)

This innovative doctrine demonstrates significant contributions, positioning Brazil as a leader in military training.

4. The main accidents that occurred during specialized troop activities that justified the creation of the simulation system.

The study entitled **"Military Free Fall Training Injuries"** (GLORIOSO, 1999) was conducted by CPT John E. Glorioso Jr., MC USA, in collaboration with LTC Kenneth B. Batts, MC USA, and SFC William S. Ward, USA. Published in 1999 in the journal Military Medicine, the study was conducted at the renowned U.S. military free fall training center, John F. Kennedy Special Warfare Center and School, located at Yuma Proving Ground, Arizona, with data also collected at Fort Bragg, North Carolina. The research

This study retrospectively analyzed the types, locations, and mechanisms of injuries suffered by military parachutists during freefall training. The results highlight the occurrence of fractures and sprains, with injuries most frequently affecting the lower and upper limbs and the spine.
This study provides a comprehensive overview of injuries in military freefall operations, and the main factors that contribute to the occurrence of accidents.

According to the study (GLORIOSO, 1999), data on accidents involving military personnel performing jumping activities were collected over a period of **56 months,** where training variables were evaluated, such as day and night jumps, armed and equipped jumps, and jumps with oxygen equipment.

One hundred and thirty-four parachutists were identified **with injuries attributed to military freefall,** with the severity of the accidents ranging from minor injuries to fatal accidents. This study highlights that injuries sustained during landing on final approach accounted for **61.2%** of all accidents.

TABLE III

MECHANISMS OF INJURY

Mechanism	No.	%
Landing	82	61.2
Deployment of canopy	13	9.7
Wind tunnel	13	9.7
Free fall	8	5.9
Open canopy	7	5.2
Ascent to altitude	2	1.5
Exit	2	1.5
Not attributed to training	7	5.2

Figure 3: Results of the main phases in which accidents occur during skydiving. The landing phase is highlighted in yellow.

Source: GLORIOSO, 1999, p. 527

Another important variable in the occurrence of accidents (GLORIOSO, 1999) is night jumps. According to this study, **night jumps** are correlated with **55%** of landing injuries. Furthermore, of the situations in which military personnel landed in trees, **64%** were during night jumps.

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TABLE IV

VARIABLES RELATED TO JUMP INJURY (TOTAL NUMBER OF JUMP INJURIES = 114)

Variable	Percent of Training	No. of Injuries	%
Day	80	64	56
Night	20	50	44
Combat equipment	50	53	46.5
Day		18	34
Night		35	66
Oxygen	20	18	15.8
Day		7	5
Night		17	95

Figure 4: Results of the main factors contributing to the increase in accidents.
Source: GLORIOSO, 1999, p. 527

According to the tables presented above, there is a great need for daily training to reduce accidents, something that only a practical simulation system can provide. These studies have the same parallel for the development of parachute jump and cargo drop activities, as described below:

> Simulation **offers exposure to dangerous situations in a controlled manner,** crucial for building automatic responses and **managing critical failures such as in parachute jumps or cargo drops.** (HOGUE, 2008)

Thanks to Captain George Lopes' pioneering work in developing the Simulated Training Doctrine and the acquisition of the necessary equipment, the Brazilian Army came to possess the most advanced means in terms of training and preparing soldiers for combat, being one of the only countries in Latin America to have a complete and integrated system for training all Brazilian Army personnel, positioning Brazil as a reference on the international stage with training involving cutting-edge technology.

5. Other challenges faced by specialized troops

According to the Small Arms Firing Campaign Manual:

> **Dry fire training** should be carried out with the military personnel [...], then with the rest of the shooters (BRAZIL, 2003).

The doctrine emphasizes, on several points, the importance of training prior to firing. Numerous studies highlight the importance of simulated shooting training.

> The simulated shooting exercises **are free.** Once you learn how to safely practice simulated shooting, you can train without spending a penny on ammunition. **Combining simulated shooting exercises with live shooting at the range makes that expensive box of ammunition last longer.** (NUNES, 2020)

It is inevitable that simulated shooting training generates benefits for technical skills and mission preparedness. The better prepared a troop is, the greater the chances of success in high-risk activities.

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6. The main tools included in the simulated military training system

Next, we will briefly present the systems developed and acquired under the coordination of Captain George Lopes and how each of these high-tech equipment components makes up the pioneering Military Training Doctrine that was originally developed from this newly implemented system.

6.1 Virtual Navigation Simulator

Among the Brazilian Army's simulation tools, the SOKOL Parachute Navigation Simulator, produced by the company ESIGMA, stands out. Below is an image of this navigation simulator from the Simulation Division Project, developed by Captain George Lopes:

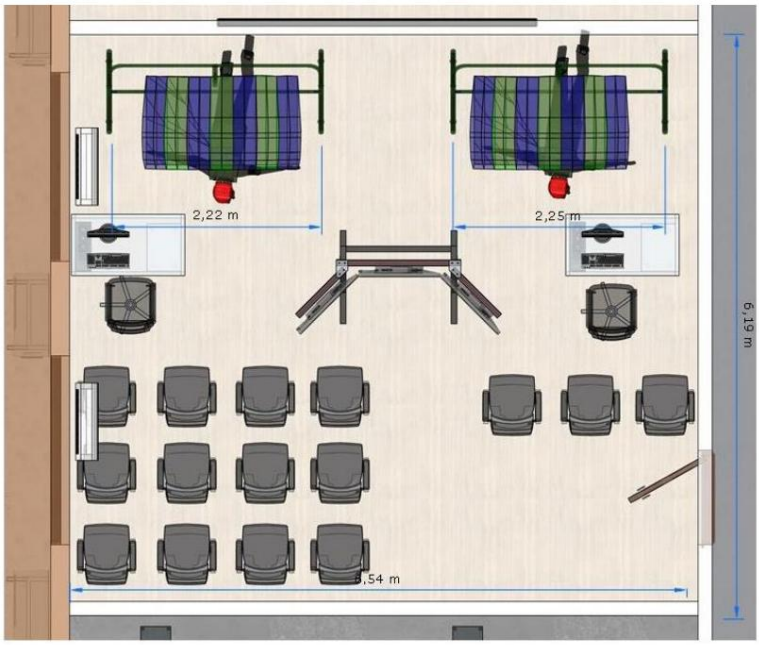

Figure 5 – Project in the Simulation Division
Source: LOPES, 2018

SOKOL is a valuable tool used to train and develop various skills necessary for military jumpers. Furthermore, it allows the instructor to provide immediate guidance and corrections, facilitating teaching and learning.

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Figure 6 – SOKOL Model
Source: https://www.sokol-sim.com/

Its capabilities make this simulator one of the best in the world, allowing for variations in the virtual environment to train all possibilities during the jump.
In this way, the instructor can alter weather conditions, such as wind direction and intensity, precipitation occurrence, and cause parachute malfunctions, forcing the soldier in training to take action to resolve the problems.

> 1.5 Simulators are also used for training free jumpers for landing in restricted areas, navigation in strong winds, and navigation with more than one jumper, through simulator settings. This type of navigation is commonly used (...) for the training of special forces. (BRAZIL, 2016, pB-1)

Figure 7 – SKOL Model
Source: https://www.sokol-sim.com/

6.2 Freefall Simulator

The Brazilian Army's Freefall Simulator (Wind Tunnel), of American origin and manufactured by the company SKYVENTURE, is the most sophisticated piece of equipment for...

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The freefall simulation that exists in the world, and which highlights Brazil as a pioneer in it.
military training.

Figure 8 – Wind tunnel
Source: Lopes, 2018.

Also known as a "wind tunnel," this simulator faithfully reproduces the freefall conditions experienced during a jump from an aircraft in flight. Its implementation has reduced the risks associated with freefall training, as well as...
It reduced training and education costs by eliminating the need for flight hours in real aircraft.

In addition to raising the level of preparedness of the Brazilian Army, the Free Fall Simulator is used to train sports teams from the Brazilian Army, Navy, and Air Force, as well as various military personnel from allied nations who come to Brazil to learn about the Military Doctrine of Simulated Training developed by Captain George Lopes.

> 1.1 The Freefall Simulator (SFS) **is the most complete mechanical auxiliary instructional tool currently available.** It was acquired with the aim of improving techniques and **reducing costs associated with the training and instruction of Brazilian Army military paratroopers.**
> 1.2 The Free Fall Simulator, also known as a Wind Tunnel, is intended for the training and instruction of Brazilian Army personnel.
> 1.3 SQL provides users with the opportunity to develop techniques and simulate procedures related to the practice of freefall jumping.
> It is estimated that 1 (one) minute of flight in the simulator is equivalent to a jump from 12,000 feet, with parachute deployment at 4,000 feet. (BRAZIL, 2022)

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Figure 9 – Wind Tunnel Model
Source: LOPES, 2018

6.3 Shooting Simulator

One of the main training tools for tactical shooting and team shooting. Especially developed for training in rules of engagement and extreme risk situations, where the soldier must make decisions in milliseconds.

It also provides a detailed description of the shooting techniques applied by the soldier, reporting the arcs of movement milliseconds before firing, allowing for the improvement of techniques and immediate feedback from the instructor.

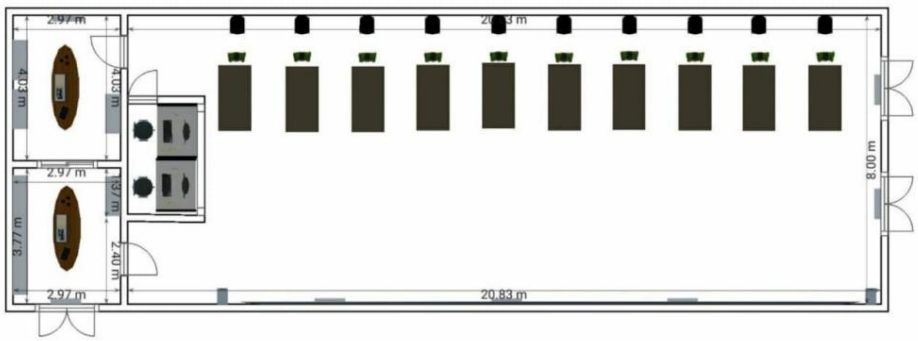

Figure 10 – Shooting simulator design in the Simulation Division
Source: LOPES, 2018

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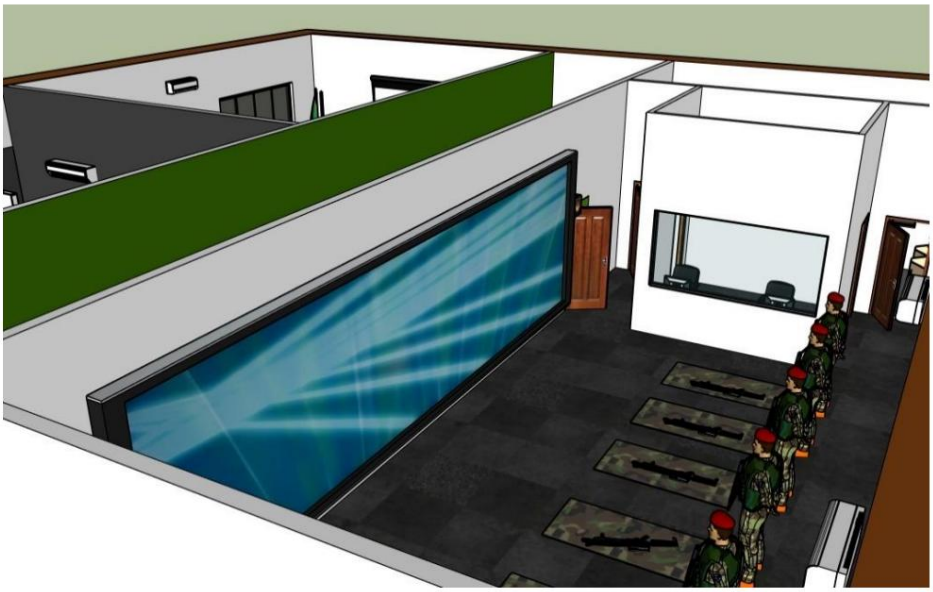

Figure 11 – Shooting simulator design in the Simulation Division
Source: LOPES, 2018

Figure 12 – soldier conducting shooting training in a shooting simulator.
Source: ARMY, 2021

6.4 Load Launch Simulator

It comprises the Simulation Training System of the Simulation Division and is the only simulation system in Latin America focused on the preparation and launch of air cargo. It allows military personnel to train for various emergency situations, enabling them to practice high-risk scenarios that could even cause a serious air accident. The system was entirely developed within the Simulation Division Project under the leadership of Commander Lopes.

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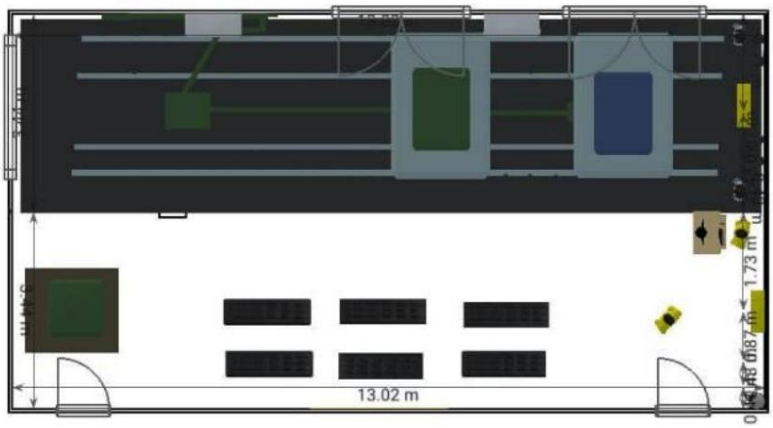

Figure 13 – Design of the load launching simulator in the Simulation Division
Source: LOPES, 2018

Figure 14 – Design of the load launching simulator in the Simulation Division
Source: LOPES, 2018

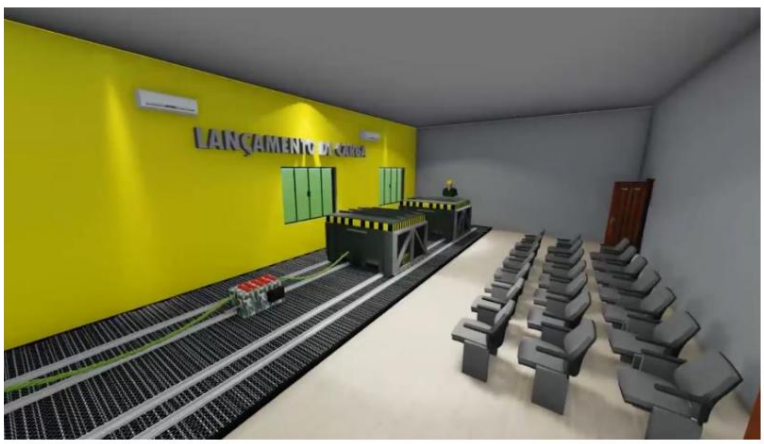

Figure 15 – Design of the load launching simulator in the Simulation Division
Source: LOPES, 2018

12

6.5 Personnel Launch Simulator

This simulator, entirely developed in Brazil as part of the Simulation Division Project, possesses extremely important capabilities for conducting personnel jumps while meeting the highest safety standards. It offers the ability to simulate the terrain where jumps will take place, making the simulation as realistic as possible.

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Developed with a fairing very similar to the aircraft used in Brazil, which enhances the fidelity between training and reality. Capable of simulating various emergencies in order to train troops for rapid responses in situations of imminent danger.

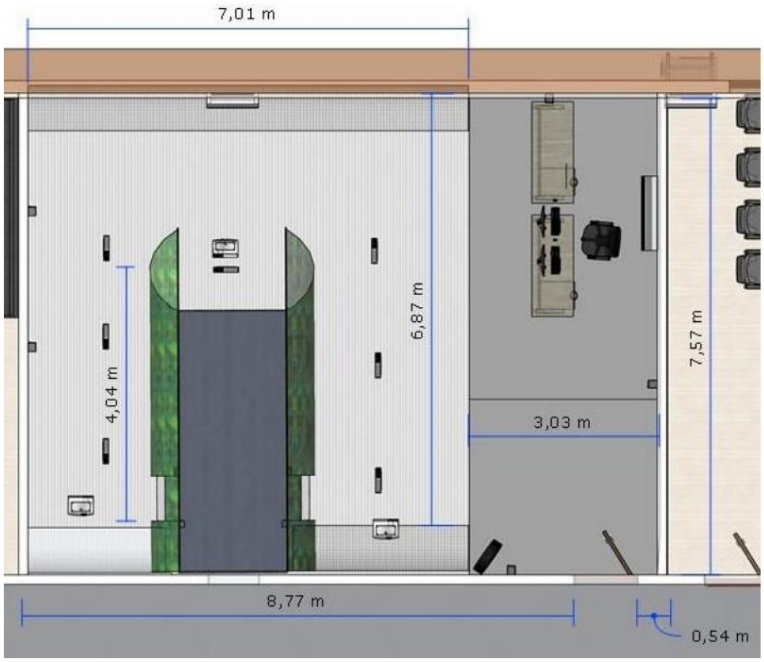

Figure 16 – Personnel launch simulator design in the Simulation Division
Source: LOPES, 2018

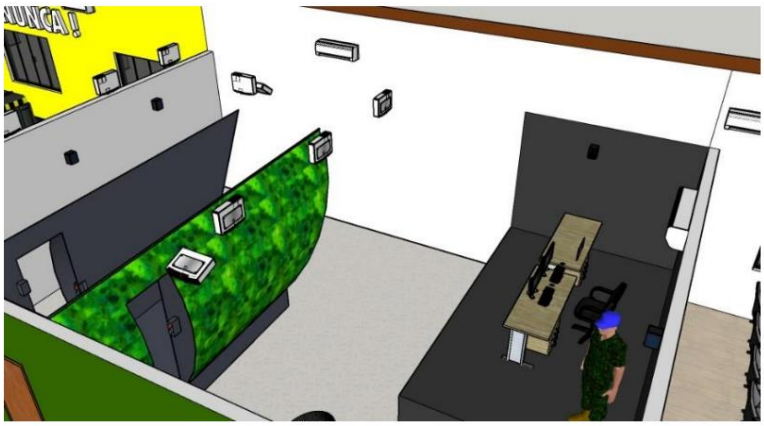

Figure 17 – Personnel launch simulator design in the Simulation Division
Source: LOPES, 2018

7. Impact of implementing simulated training doctrine on the safety of Brazilian Army personnel.

To verify the impact on military safety, a survey was conducted with military personnel trained in the Simulation Division's Training System, involving members of the Brazilian Army, Air Force, Brazilian Navy, and foreign military personnel from allied nations trained in Brazilian Army courses. The impact generated by this project on the training and safety of Brazilian Army military activities is unprecedented. Some data is presented below:

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CHART 1: Responses to question 1
Source: The author

CHART 2: Responses to question 2
Source: The author

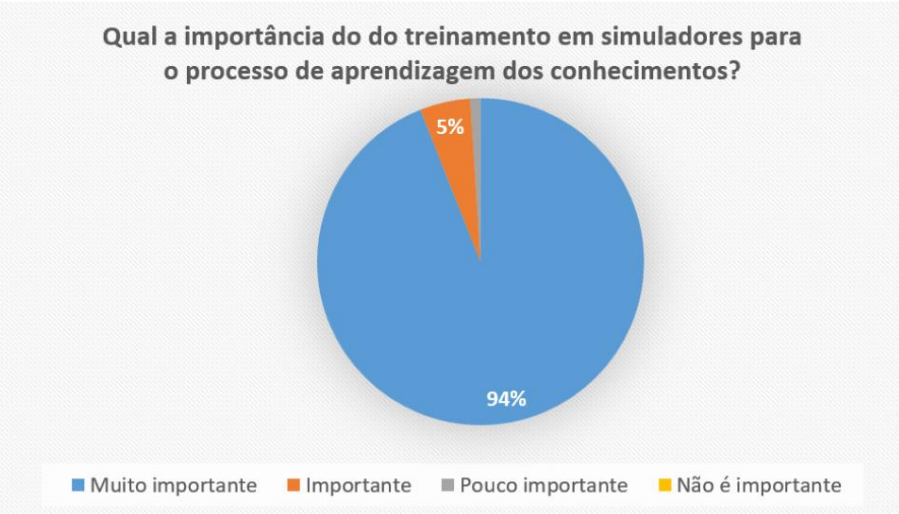

CHART 3: Responses to question 3
Source: The author

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Based on the results presented, it appears that the majority of participants consider the use of the Simulated Training System in military training to be of utmost importance. Among the responses, **97% consider** the use of the System to be very important.

When analyzing the effects of simulator training on increasing the perceived safety level among military personnel, we observed that **98% fully agree** that there was an increase in safety for the troops. Furthermore, **94% fully agree** that the use of the developed simulation system decisively contributes to the teaching and learning process during the courses offered.

Conclusion

In military activities, troops require a high level of training, as soldiers are exposed to situations of imminent danger that demand an immediate response.
(BRAZIL, 2016)

The data collected shows that the **Brazilian Army soldiers interviewed agree that the use of the Simulated Training System developed under the leadership of Captain George Lopes is essential for the success of missions.** This perception is corroborated by studies that demonstrate the effectiveness of simulators in reducing accidents and improving the skills of soldiers (GLORIOSO, 1999).

These data confirm the successful implementation of a pioneering system in Brazil, which culminated in the subsequent development of its own highly effective training doctrine. The intellectual development of a new, effective training doctrine and cutting-edge simulation systems have positioned Brazil as a benchmark in the Latin American context, attracting the interest of several allied nations in implementing a similar system in their countries.

References

BRAZIL. Brazilian Army. **Freefall Technical Manual:** EB 60 MT34.405. 1st Ed.
Ministry of Defense, Department of Education and Culture, 2014.

UNITED STATES. United States Army. **Special Forces: Military Free-Fall Operations,** ATP 3-18.11, 1st Ed. United States Army. Fort Bragg, NC, 2014.

BRAZIL. Brazilian Army. **Freefall Jump Master's Manual,** General Penha Brasil Parachute Training Center, Rio de Janeiro, RJ, 2022.

Wasdin, Howard E. et al, **SEAL Team Six: Memoirs of an Elite Navy SEAL Sniper,** 1st Ed, São Paulo, SP, 2012.

LOPES. **Project for the construction of the training and simulation division of the parachute instruction center.** Rio de Janeiro, 2018.

LOPES. **Feasibility study for the construction of the training and simulation division of the parachute instruction center.** Rio de Janeiro, 2019.

BRAZIL. Brazilian Army. **Airborne Operations,** EB70-MC-10.217, 1st Ed.
Ministry of Defense. Brasília, DF: Army Doctrine Center, 2017

NUNES. **Combat simulation in the Brazilian army and its contribution to the operational readiness of the land force.** Final Course Project, Higher School of...

ROMeS - Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

War, Rio de Janeiro, 2020.

ESIGMA (SOKOL Simulator). **At <https://www.esigma-systems.com/parachute-training-systems/sokoltm-parachute-training-systems>**

HOGUE. **Enhanced Safety and Effectiveness in Parachuting Training and Mission Performance through Virtual Reality Simulation,** Australia, 2008.

BRAZIL. Ministry of Defense. Brazilian Army. Army Education Portal. **The Use of Simulators.** Brasília, Available at <http://www.portaldeeducacao.eb.mil.br/index.php> DF, 2016.

BRAZIL. Brazilian Army. **Glossary of terms and expressions for use in the Army** C 20-1. 3rd Ed. Ministry of Defense. Brasília, DF: Army General Staff, 2003.

BRAZIL. Brazilian Army. **Army capabilities catalog:** EB 20C-07.001. Army General Staff, Brasília: Army Doctrine Center.

BRAZIL. Brazilian Army. **Airborne Operations,** EB70-MC-10.217, 1st Ed. Ministry of Defense. Brasília, DF: Army Doctrine Center, 2017.

BRAZIL. Brazilian Army. **Manual for firing small arms in the field,** C 23-1, 1st Ed. Ministry of Defense. Brasília, DF: Army Doctrine Center, 2003.

BRAZIL. Brazilian Army. **Meteorology for airborne service:** T 57-280. 2nd Ed. Ministry of Defense. Brasília, DF: Army Doctrine Center, 2000.

GIL, Antônio Carlos. **How to prepare research projects.** 4th ed. São Paulo: Atlas, 2008.

ABNT NBR, **Information and documentation — Academic works — Presentation,** 3rd edition Ed, São Paulo, SP, 2011.

UNITED STATES. FM 90-26: **Airborne Operations.** Washington, DC: Headquarters Department of the US Army, December 1990.

UNITED STATES. US Army. **STUDENT TEXT 20-3: Typical American Expressions and Military Terminology for International Officers.** Fort Leavenworth, Kansas, 1992.