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Capacity building: a study of organizational culture effects on fighter pilots training		
<p>The reality of modern military training is the rapprochement of nations and the construction of military alliances to enhance nations defense cooperation and expand capabilities. Preparing for this scenario of cultural diversity is the challenge in designing military training programs for different groups. While training has a basic structure, different cultural environments require different approaches.</p> <p>Using a quantitative method, collected through a survey study, this thesis examines Brazilian and Swedish fighter pilots' perceptions of organizational culture and its impact on training. The flight simulator training environment was used for operationalization due to its characteristics of accessibility, fidelity to real operations, and flexibility in the training program.</p> <p>The results showed that organizational culture was identified with a statistically significant difference in the indexes of individualism, masculinity, uncertainty avoidance, and indulgence between the two populations studied. This has implications for both training planning and capability management in the Air Force.</p>		
Key words:		
Air Force, training, fighter pilots, organizational culture, flight simulator.		

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1. INTRODUCTION

1.1 Introduction to the subject

The study of the military training history is relevant to the scientific community (Taylor, 2014). Continuous military training is essential to develop and keep defense capability of any nation. It prepares service members to deal with dangerous environment and uncertainties and ensures that the armed forces are ready to respond to threats to national security and global interests (Yardley, 2012, pp. 5-7). The requirements are similar when focused on training Air Force pilots, but due to the more technical nature and higher operational risk, this training becomes more demanding and complex. (Warden, 1998, pp. 49-51).

As a factor present in current training programs, the preparation of military forces in an intercultural environment is a concrete reality. This is a phenomenon massively observed in Western militaries, especially in European military units after the WWII, where multinational cooperation became an important condition for generating and maintaining operational capabilities (Sven Biscop, 2022). In such environment, simulators are appropriate solutions for the application of this practice. Specifically in the Air Force operational environment, flight simulators are widely used as solutions to reduce cost and risk, combined with high degree of fidelity. (Allerton, 2009)

1.2 Research problem

In the last two decades of air warfare, it has become clear that 21st century combat is very different from the traditional interstate wars of the 20th century and earlier. Interstate cooperation and alliances of multinational military cooperation are a reality in many regions. The challenge is to define how today's militaries can prepare current and future warfighters for these multiple roles, and to understand the practical and tactical training of militaries facing opposing forces on the battlefield. (Enstad & Holmes-Eber, 2020, p. 43-4)

Cooperation and exercises among countries to strengthen defense systems is a constant in the military training and employment environment. Concrete cases are the creation of the North Atlantic Treaty Organization (NATO) and, in the context of the Nordic countries, the close cooperation between the countries of the peninsula, such as the Nordic Defense Cooperation (NORDEFECO). (Ann-Sofie Dahl, 2022)

Interaction between different cultures is a recurring situation in the context of defense forces, especially as they are challenged by the need to establish and maintain cooperative relationships among military forces from different countries (Cantwell, 2003, p. 14). The need to

prepare for joint actions and international operations drives the need to develop specific skills, such as the ability to communicate with other military forces from different cultures. As such, military training has focused on establishing a knowledge base of cross-cultural interaction to improve the ability to work with other military forces around the world (Bennett et al., 2005). And this is the environment in which the operational rapprochement between the Swedish and Brazilian Air Forces is taking place with the joint development and training of the Gripen E fighter jet.

Although this phenomenon is common to both corporate and military activities, this rapprochement and interaction between different cultures has been studied more extensively in the environment of multinational corporations than in military units that cooperate with different countries. Studies in the corporate environment have examined how leaders and employees can use organizational culture to achieve goals and create a positive work environment (G. Hofstede, 2010, p. 43). Thus, there is a gap in knowledge about the impact of cultural differences on the training of military forces, especially in the Air Force environment, which has a specific technical and tactical approach to training based on theoretical training, the use of simulated environments, and the operation of the actual equipment itself. (Westra, 1983)

1.3 Research question and purpose

Considering the importance of generating and maintaining operational capabilities for modern air forces, taking advantage of the means available to carry out the training and maintenance of combat pilots, especially in an intercultural training environment. Another important starting point is the theory of training transfer, which relates the impacts of training in simulators with activities related to operation on real equipment conditions.

The understanding of the factors existing in the organizational culture of different military national forces and institutions, as well as the analysis of their training programs, are fundamental for the improvement of the results obtained. In this context, the present work seeks to investigate the cultural factors existing in military institutions and their implications in the training of fighter pilots. The objective is to identify the main influences of these factors on the training of pilots and to evaluate the adequacy of training programs to obtain better results.

This essay does not intend to clarify all aspects of the situation, but only to investigate the perception of pilots serving in an operational division of two distinct cultural environments on the influence of organizational culture on the combat training program. The essay focuses on the perceptions of operational fighter pilots regarding the training conducted in flight simulators by investigating the following research question:

Do Swedish and Brazilian fighter pilots have different perceptions of flight training activities?

The question is motivated in the context that the organizational cultures of the Swedish and Brazilian Air Forces have anecdotal differences that may affect the training of fighter pilots. These differences manifest themselves in the hierarchical structure of each institution, the value system and the way the military is prepared to achieve military objectives. This research aims to analyze the context of organizational culture and compare the differences between two Air Forces regarding the training of fighter pilots to understand how these differences affect the perceived outcomes of the training of these military personnel.

The research purpose is to present the main factors considered by fighter pilots in the conduct of flight training, focusing on the intercultural cooperation programs that involve operational fighter squadrons. In the academic environment, this research contributes to the understanding of the environmental factors that influence flight training programs. Outside the academy, in practical application, the study aims to contribute to military institutions to make a better implementation of operational training, considering the relevant factors for programs based on training in an intercultural environment.

1.4 Empirical data

This quantitative methods research, comparative, questionnaire study (Rienecker, 2018, p. 239) was conducted through filling anonymized surveys, comparing respondents perception with a deductive approach, with the focus on highlighting factors considered important by each particular Air Force. The training in flight simulators was used as object of research, due to the greater flexibility and access that this modality presents, when compared to training in real aircraft.

The population studied was composed by military pilots of Swedish and Brazilian Air Forces, inserted in the operational context of fighter aircraft, in air bases that have operational squadrons with the performance of training in flight simulators systems, as in real fighter aircraft. It was adopted a positivist approach, in which the researcher sets up a complete separation between the observer and what is observed, taking care not to 'contaminate' the research by becoming part of it. (DellaPorta & Keating, 2008, p. 31)

1.5 Delimitation

Since the research focuses on flight simulator training activities, other types of training, such as prior theoretical preparation and real aircraft activities, are excluded. The population was limited to fighter pilots, so other categories of military pilots, such as transport, helicopter, and other armed forces airborne activities, are outside the scope of this document.

2. RESEARCH OVERVIEW

2.1 Organizational culture

The first systematic study of organizational culture was conducted in the 1980s by Schein (2010), which established the concept of cultures of depth, which describe the deepest level of culture, i.e. the shared values, basic assumptions and beliefs that are shared by all members of the organization. From these studies, research on organizational culture has evolved to more directly address the issues of power, control, and change (Ravasi & Schultz, 2006). This approach focused on identifying cultural elements that affect decision-making, as well as their impacts on the organization's structure, employee behavior, training and organizational success. (Kotter & Heskett, 1992)

Organizational culture theories have also focused on the analysis of the internal dynamics of culture and their impacts on the organization's performance (Denison et al., 2004). These studies addressed the effects of culture in terms of motivation, leadership, and innovation, as well as the distinctions between strong and weak cultures, based on the intensity of shared behavioral patterns and the characteristics that define them (Kahn, 1990).

Research on organizational culture has also addressed the role of culture in organizational change. These studies examined the role of leaders in creating and maintaining culture and also highlighted the role of culture in managing change (Hatch, 1993). These studies highlighted the importance of culture in creating an organizational environment that helps the organization adapt to changes in the environment and promote long-term success (G. Hofstede, 2010).

2.2 Organizational culture and military training

First registered study on the military training was conducted by William Pascoe, who described the basic principles for effective military training. At that time, the military forces were trained to prioritize obedience to orders through strict discipline (Mansoor & Murray, 2019). In the 1990s, studies on organizational culture applied to military training began to focus on the construction of cultural identity, which included the development of shared values and

beliefs. This training became competency-based, with an emphasis on leadership, communication and teamwork. (Foster & Fletcher, 2013)

From the studies on organizational culture applied to military training, it was possible to identify the importance of cultural context in effective training and development of training models based on distinct cultures. However, for a better subject understanding, it is necessary to deepen about the effects of organizational culture on military training. Thus, it is observed that the research field has focused on leadership and management expertise, then in the analysis of the effects of organizational culture on the tactical training programs of the military forces. As well as little or no attention was paid to the context in which combat pilot training programs were planned and conducted. This knowledge gap was identified for the development of this research, which focuses on the effects of different organizational cultures on fighter pilot training in a flight simulator environment.

2.3 Research contribution

The literature review shows that cultural aspects are relevant to the conduct of organizations' training programs. However, the application of these concepts in the training of military forces has rarely been explored by researchers. The present thesis, developed on the study of the effect of organizational culture on the training of military forces, contributes significantly to the understanding of interaction between these cultural elements and the activity of military practice. The study includes an evaluation of the main characteristics of organizational culture, as well as analyzing how these factors affect military training. The obtained results were essential for understanding the mechanisms and processes influencing the training of operational fighter pilots.

The research also contributes to the identification of environmental factors that directly affect the training of military fighter pilots. The evaluation of such factors allows us to understand the impact of organizational culture and how it relates to training, as well as to indicate ways to improve the effectiveness of training, with a special focus on flight simulators. These results provide important guidelines for military forces in implementing more effective training.

Study's relevance lies in the fact that it increases our understanding of the use of flight simulator as an important airpower training system, creating, and delivering capabilities to the Air Forces. As a theoretical contribution, this research discusses the factors presented by Geert Hofstede (2010), with the aim of strengthening the cultural dimensions theory research field, highlighting the relevant factors to the specific environment of air force operational fighter

pilots. Furthermore, the study results can contribute to reflections on the practical use regarding doctrine development, training planning, and pilots' education.

3. THEORY

3.1 Transfer of Training theory

The "transfer of training" concept emerged in the early 20th century from the debate between two existing approaches to the subject. Thorndike and Woodworth introduced the term in the context of schooling as a counterpoint to the educational approach of late 19th century (King, 1904). In the 1920s, this concept evolved, with the positivity brought by behaviorism shifting the subject's selective and active capacity to the experimenter (Cox, 1997, p. 45). It was theorized that if the full identification of the stimuli and responses that make up the learning situation were clearly specified, the transfer of training could be determined (Osgood, 1949). In the 1960s and 1970s, the theory was largely reduced and Gagné found that there were no significant differences between learning and transfer (Gagné, 1965). In the 1980s, the theory was revived, and Salomon and Perkins described two methods for promoting transfer. Later developments have brought the field of transfer back into a broader perspective of functionalism. Transfer of training theory is rooted in the process of adaptation to achieve a goal, moving a skill learned in one context to another (Perkins, 1989).

3.2 Transfer of training theory applied to flight simulator

Regarding the application of transfer of training theory to the environment of flight simulators, the first studies found refer to the late 1950s. Due to the characteristics of the simulators of that period, the highest effectiveness of training transfer was recorded in the takeoff, approach for landing and landing phase (Carretta & Dunlap, 1998). With a case of specifically military activities, such as the employment of dropped armament, Lintern et al. (1989) manipulated the contents of the scene and increased feedback in a training study of near-transfer air-to-ground attack skills, dropping bombs on a flight simulator mission. The conclusion was that the accuracy of the bombardment improved because of simulator training. The authors noted that no further improvement in bombing accuracy was achieved after 24 simulator missions. Thus, the automation actions created by Thorndike, and the low-road transfer, suggested by Salomon & Perkins, clearly apply to the above-mentioned research.

Training transfer usually refers to the use of knowledge and skills trained at work. For transfer to occur, "the learned behavior must be generalized to the work context and maintained

for a period of time at work" (Baldwin & Ford, 1988, p. 63). The choice of this theoretical reference was motivated by the analytical approach of the factors involved in the transference process, since it considers the individual, training program and the environment. Thus, authors focused on using a sufficiently rigorous methodological approach, isolating substantiated variables by findings from a meta-analysis by at least two empirical studies in peer-reviewed journals. After classified, the main elements were categorized into 3 factors: **learner characteristics, intervention design, and work environment**. As this research focuses on analyzing the work environment in which flight simulators are inserted, learner characteristics factors that influence transfer of training will not be addressed.

3.3 Culture and Organizations

This section is dedicated to presenting the theoretical framework and concepts contained in the "Cultural domains theory", developed by Geert Hofstede. It explores the relationship between organizational cultures in different nations. The choice of this theoretical model was motivated by the fact that this framework provides an overview of the cultural differences that exist in a work environment. In this literature, the author presented the following cultural dimensions (G. Hofstede, 2010):

Power Distance Index (PDI): is defined as the extent to which the less powerful members of a country's institutions and organizations expect and accept that power is distributed unequally.

Individualism Index (IDV): The fundamental issue addressed by this dimension is the degree of interdependence a society maintains among its members. It has to do with whether people's sense of self is defined in terms of "I" or "we". In individualistic societies, people are supposed to care only for themselves and their immediate family. In collectivist societies, people belong to "in-groups" that take care of them in exchange for loyalty.

Masculinity Index (MAS): this dimension of Masculine vs. Feminine values refers to the values that drive a society. A society with a high Masculine score is motivated by competition, achievement, and success, while a society with a low Feminine score is motivated by caring for others and quality of life. This difference in values reflects the different motivations of individuals, whether it is to be the best (Masculine) or to enjoy what they do (Feminine).

Uncertainty Avoidance Index (UAI): it is a cultural dimension that refers to a society's attitude toward dealing with unknown or ambiguous situations. Different cultures have developed their own ways of dealing with the anxiety associated with an unpredictable future, such as creating beliefs and institutions that seek to reduce uncertainty and control the future. This

is reflected in a score that measures the extent to which individuals in a culture feel threatened by unknown situations.

Long-Term Orientation Index (LTO): it discusses the importance of balancing the preservation of a society's past with progress in the present and future. Societies with low scores on this dimension tend to be more traditional and resistant to change, while those with high scores tend to be more pragmatic and prioritize modern education and thrift to prepare for the future.

Indulgence Versus Restraint (IVR): socialization is an essential part of humanity as it helps to control desires and impulses. Different cultures are characterized by their level of control, either indulgent or restrained. This plays a major role in how people are raised and how they interact with the world. Cultures can, therefore, be described as Indulgent or Restrained.

3.4 Theory discussion

Transfer of training theory is an important concept in the study of flight simulator training. It is a theory that states that skills and knowledge acquired in one context can be applied to another. This theory has implications for flight simulator training because it suggests that the skills and knowledge learned in a flight simulator can be transferred to a real-world environment.

An individual learns how to operate the aircraft in a flight simulator and then uses that knowledge and experience in the real aircraft. This transfer of knowledge and skills is important as long as it allows pilots to apply their knowledge and experience in a real-world environment. It also helps ensure that the resources invested on flight simulator training are not wasted, it is quite the opposite, as pilots can use simulator training to improve their performance in the aircraft.

In addition, training theory transfer can help the aviation industry evaluate the effectiveness of its training programs. By understanding how skills and knowledge transfer from the simulator to the real world, the industry can ensure that its training programs are well designed and effective.

Regarding to the culture perspective, the national culture has a major impact on organizational culture, as evidenced by the work of cultural psychologist Hofstede, who highlighted six dimensions of cultural values. In addition, several authors such as Trompenaars, Meyer, Hampden-Turner, and Tannen have also addressed this relationship. These studies suggest that national culture and organizational culture are closely related. Therefore, understanding this relationship is important for organizations because it can help bridge the gaps between these

cultures. By applying these theories, the national cultures of Sweden and Brazil can be used to examine the impact of organizational culture on the Air Force of both countries in training fighter pilots.

4. RESEARCH DESIGN

4.1 Scientific theoretical starting point

As the aim of this study is to study the difference in perception of organizational culture aspects in the training of combat pilots in the Air Force, and from this to reach new conclusions, the positivist scientific tradition was adopted (DellaPorta & Keating, 2008, p. 26). This means that the thesis has an explanatory deductive approach to the cases investigated, with the objective of finding connections between the chosen theories and the use of flight simulators as a training method. Being an explanatory study also means that it is possible to test, question and refine theories through a new case with an explanatory theoretical framework (DellaPorta & Keating, 2008, p. 114).

The choice of a quantitative method for the research was motivated by the need to obtain objective, measurable and statistically analyzable results. This allowed interpretation based on evidences collected from primary sources, comparison between the two groups studied, and the possibility of replication and results validation by other researchers.(Denscombe, 2021, p.325–6). In addition to the quantitative data, respondents' free text was analyzed to identify patterns and nuances that may not have been anticipated when the closed-ended questions were designed. Through coding and categorization, it was possible to group and classify responses into thematic categories and identify recurring trends and patterns. This approach complemented the quantitative analysis of the closed-ended data and provided a deeper understanding of the phenomenon. (Fejes & Thornberg, 2019, p. 48–55). In this way, the research split effort between statistical analysis of the responses collected and their open text comments. While statistical analysis allows us to understand the relationships between external factors and the results of the research, the opinions collected was also considered, allowing us to raise the level of understanding of the participants' perceptions on the subject.(Fejes & Thornberg, 2019, p. 19-20)

The training of fighter pilots in flight simulators was used as a method to evaluate the training. The choice of using simulated missions rather than real aircraft is justified by the fact that flight simulation training programs allow more flexibility and availability than real aircraft and present a higher level of initiative by the pilots to carry out additional training to the

program prescribed by the Air Force, guided by their interest and need for improvement. Since the focus was on cultural differences, but with control of the professional training environment, the selection of pilots from the Swedish and Brazilian Air Forces proved to be relevant cases, as they illustrate the uniformity of professional conditions with differences in national and organizational cultures, based on Hofstede's (2010) cultural dimension measurements.

4.2 Choice of method

4.2.1 Survey study

Since the study objective was to analyze the cultural factors influencing flight simulator training, the method of choice was a survey, that was considered a useful research method as long as it allows the researcher to collect data directly from participants in a relatively inexpensive, quick, and widespread way. In fact, surveys are a very practical and useful research tool. Surveys also make it possible to get more honest answers from participants because they can be answered anonymously (Denscombe, 2021, p. 212). In addition, questionnaires provided quantitative and open text responses that could be easily analyzed, making the research process more efficient. For all these reasons, the present research decided to use surveys as a method, as it was the one that best suited the public of the respondents, as they were in different countries.

4.2.2 Method of data collection

For data collection, questionnaires were selected, specifically web-based versions, justified by the fact that respondents were remote and physically dispersed from the researcher, with a response of 199 fighter pilots from both countries, 45 from the Swedish Air Force and 154 from Brazil. More specifically, the survey was conducted with a written list of questions, produced in English, containing 15 direct questions to the respondents. In order to get the most engagement, honesty and transparency from the respondents by removing the language barrier, open answers were given in one of the three possible languages (English, Swedish and Portuguese). The questions were presented in a closed form, using a 7-point Likert scale, and complemented with open fields. (Denscombe, 2021, p. 223).

The sample size was defined based on the work of Raghunath (2017), considering a total population of 250 fighter pilots. The sample was defined as 152 questionnaires answered, so that the research reaches the levels of validity and reliability acceptable, 95% sample confidence space, according to the reference.

4.3 Operationalization

To achieve high conceptual validity and reliability, operationalization seeks consistency with the original theory (Denscombe, 2021, p. 323). Therefore, the purpose of the study, as well as the research question and the theory, must be considered when operationalizing the variables.

Through definitions and the construction of indicators, operationalization involved the transformation of abstract theoretical Transfer of training and Cultural dimensions concepts into visible, tangible units. In this sense, questions and indicators derived from the theories were created (Denscombe, 2021, p. 257). This provides the essential structure and focus on the cases, as the two cases are compared and only the important data are analyzed. The goal was to answer these questions in order to close the knowledge gap that was found. The scope and direction of the operationalized questions are within a problem that needs to be addressed. They must be broad enough to apply to both situations in the comparison and specific enough to be consistent, specific enough to be consistent with the theoretical framework.

Since the intention is to answer the questions through a structured, focused, and comparative method, the analysis is explanatory in nature (Denscombe, 2021, p. 305) Thus, the results of the first stage of the analysis will be compared among the actors to determine why there are differences in organizational culture and perceptions of flight simulator training.

From the above explanation, the analytical work takes place in three stages and the tools are presented:

- Step 1: The variables are defined, identified, and coded in the empirical data (indicators).
- Step 2: The values of the variables are specified and evaluated in terms of the degree of impact of the independent variable on the dependent, i.e. the subjective evaluation.
- Step 3: Analysis performed using quantitative method, for 7-point Likert scale questions and open text data.

4.3.1 Step 1: definition, identification, and codification of variables

Dependent variable: The dependent variable that was analyzed in both populations was the transfer of training. To compare the selected cases, this variable requires a presupposition of conditions that encompass its meaning, as presented in the Table 1 below. This makes empirical research more focused on finding the real impact factors of independent variables on the use of flight simulator.

Dependent variable	Conditions
Transfer of training	<ul style="list-style-type: none"> - The use of flight simulators for fighter pilots at air squadrons. - As a complementary activity to training in real fighter aircraft. - Aimed to have effect at the tactical level, in isolated use or in conjunction with other equipment at the tactical level. - Pilots' perception measured by survey question 15

Table 1: conditions to dependent variable

4.3.2 Independent variables: The essence of Baldwin & Ford's theory, adapted for the influence of Hofstede's cultural domains, are the factors of work environment and training design, each divided into subcategories. For this study, these factors are expected to explain and understand the perception of training by Swedish and Brazilian fighter pilots and why they differ and are therefore considered as independent variables.

To guide the measurement of the independent variables, a set of indicators was defined, as shown in Table 2. Survey questions (SQ) are presented on Annex 1.

Independent variables	Indicators
Cultural dimensions	<ul style="list-style-type: none"> - Power Distance Index (PDI): measured by survey question (SQ) 1 - Individualism Index (IDV): SQ 2 - Masculinity Index (MAS): SQ 3 - Uncertainty Avoidance Index (UAI): SQ 4 - Indulgence Versus Restraint (IVR): SQ 5
Intervention design	<ul style="list-style-type: none"> - Learning goals: measured by SQ 6 - Content relevance: SQ 7 - Practice & feedback: SQ8 - Behavioral modeling: SQ 9 - Error-based examples: SQ 10
Work environment	<ul style="list-style-type: none"> - Transfer climate: measured by SQ 11 - Supervisory support: SQ 12 - Peer support: SQ 13 - Opportunity to perform: SQ 14

Table 2: Indicators related to independent variables

4.3.3 Step 2: Variable values specified

After identifying how the indicators are translated by the empirical material, according to the theory, it is necessary to determine and evaluate their values, thus measuring the explanatory power of each independent variable. Thus, the variables were coded as ordinal variables and categorized by Likert scale, by 7 levels of agreement. This evaluation was done qualitatively, depending on the strength and influence of each internal indicator. Open text answers data were analyzed, complementing the quantitative study, and providing a deeper interpretation, allowing a narrow view of how the independent variables interacted with flight simulator training. It also helped to identify which elements were the most important.

The responses were summarized in national tables (Sweden and Brazil) with gross and percentage results of the responses. To highlight the majority responses, the responses median and standard deviation were presented. Inferential statistics were chosen to present an overview of the collected data, identifying patterns and relationships between the data, to describe and summarize the amount of data collected. In addition, the choice sought to highlight the distribution and data variability to provide a more accurate picture of the current situation of all subfields surveyed. (Tutz, 2012, pp. 118–9)

4.3.4 Step 3: Analysis via quantitative method

For quantitative data, the statistical analysis method chosen was the hypothesis t-test for the difference between two means, which allows to conclude if they are statistically significant. The quantitative analysis focused on searching for significance by comparing the ordered pairs of questions presented to the two groups of pilots, in order to verify whether the difference between the two samples was due to the randomized effect or whether there was a real effect. (Navidi, 2020, p. 443–5)

Regarding the open text data, the comments registered by the pilots' respondents were analyzed using coding and categorization. The choice of this method was motivated by the need to deepen, complement, and contrast the data obtained in the close-ended questions. In addition to expanding the understanding of the responses from these fields, through the agglomeration of comments into the themes of study, under the aspects of cultural dimensions and transfer of training. (Fejes & Thornberg, 2019, p. 194–208)

4.4 Ethical considerations

According to the Act on Ethical Review of Research Involving Human Subjects, ethical review is not required for student work at entry or advanced level (SFS, 2003:460, §2), which also applies to this work. As the research deals with an issue of national defense interest to two

countries with a high level of information security, no sensitive data was collected that could compromise the training or readiness level of the Air Force components surveyed and the questionnaires were administered in a manner that ensured the anonymity of the participating pilots (Denscombe, 2021, p. 25–6). Respondents were only those who volunteered during the period when the questionnaires were available for completion, and there was no pressure to take part in it.

5. RESULTS

5.1 Quantitative data

5.1.1 Cultural dimensions

The quantitative data regarding cultural dimensions are first presented in histogram format, to highlight the difference in means of the respondents' answers.

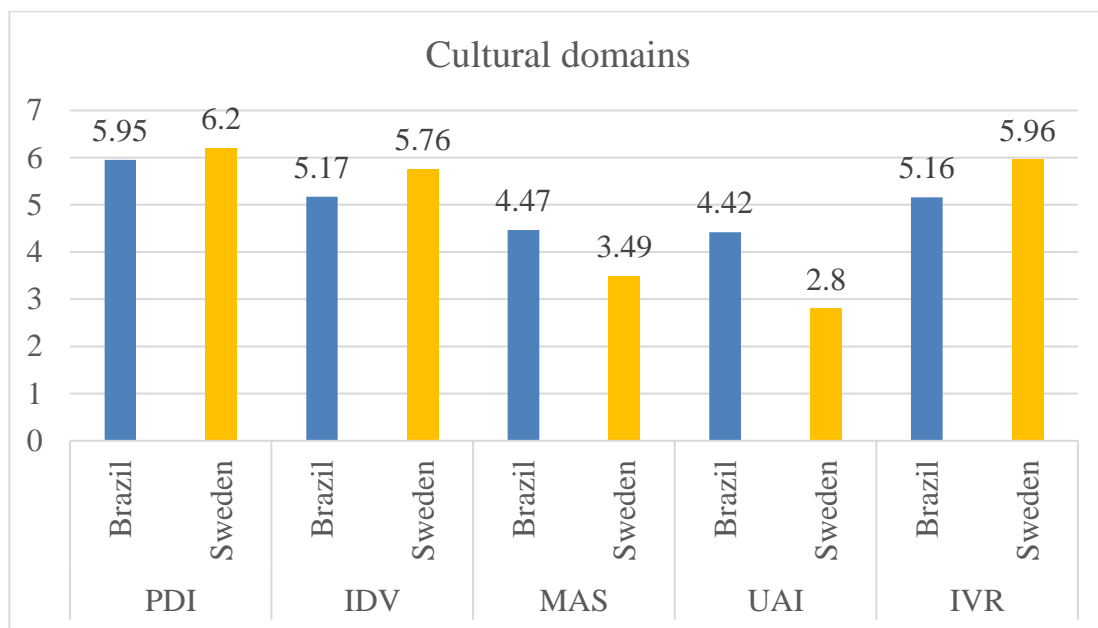


Figure 1: Cultural domains results – means of responses

Cultural domain factors presented on table 3, in the form of descriptive statistics results:

Nation	PDI			IDV		MAS		UAI		IVR	
	N	M	SD	M	SD	M	SD	M	SD	M	SD
Brazil	154	5.95	1.034	5.17	1.468	4.47	1.669	4.42	1.524	5.16	1.532
Sweden	45	6.20	1.140	5.76	.957	3.49	1.646	2.80	1.455	5.96	1.021

Table 3: Descriptive statistics group results - cultural domain results.

In order to determine the significance of the results presented, independent samples t-test was performed and presented in Table 4.

Variables	Mean Difference	Lower	Upper	P
PDI	-.252	-.606	.102	.162
IDV	-.587	-1.045	-.129	.012*
MAS	.985	.429	1.541	.001*
UAI	1.616	1.111	2.120	<.001*
IVR	-.793	-1.272	-.314	.001*

Table 4: Cultural domains. Independent Samples t-test.

The quantitative data presented in Table 4 shows that the responses to the IDV, MAS, UAI, and IVR factors were significant. PDI, on the other hand, was less significant than the 95% established for the survey.

5.1.2 Transfer of training (ToT)

The quantitative data regarding transfer of training factors are first presented in histogram format, to highlight the difference in means of the respondents' answers.

a) ToT - Intervention design

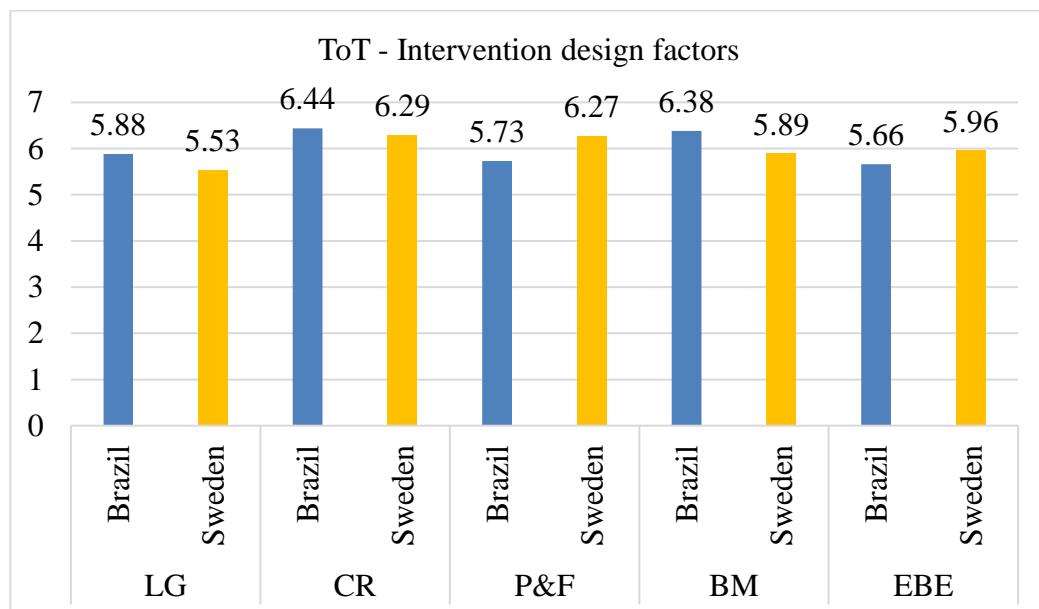


Figure 2: Intervention design results – means of responses

Intervention design factors presented on table 5, in the form of descriptive statistics results:

Nation	LG			CR		P&F		BM		EBE	
	N	M	SD	M	SD	M	SD	M	SD	M	SD
Brazil	154	5.88	1.151	6.44	.800	5.73	1.434	6.38	.930	5.66	1.320
Sweden	45	5.53	1.014	6.29	1.014	6.27	1.074	5.89	1.027	5.96	.999

Table 5: Intervention design. Descriptive statistics group results.

In order to determine the results significance presented, the independent samples t-test was performed and presented in Table 6.

Variables	Mean Difference	Lower	Upper	P
LG	.343	-.032	.718	.072
CR	.146	-.139	.431	.313
P&F	-.539	-.994	-.084	.020*
BM	.494	.161	.827	.003*
EBE	-.293	-.613	-.073	.170

Table 6: Intervention design. Independent Samples t-test.

From the quantitative results collected, Practice & Feedback (P&F) and behavioral modeling (BM) domains provided significant differences, in which pilots responded that the activities in the flight simulator were perceived with significant difference between the two groups.

b) ToT - Work environment

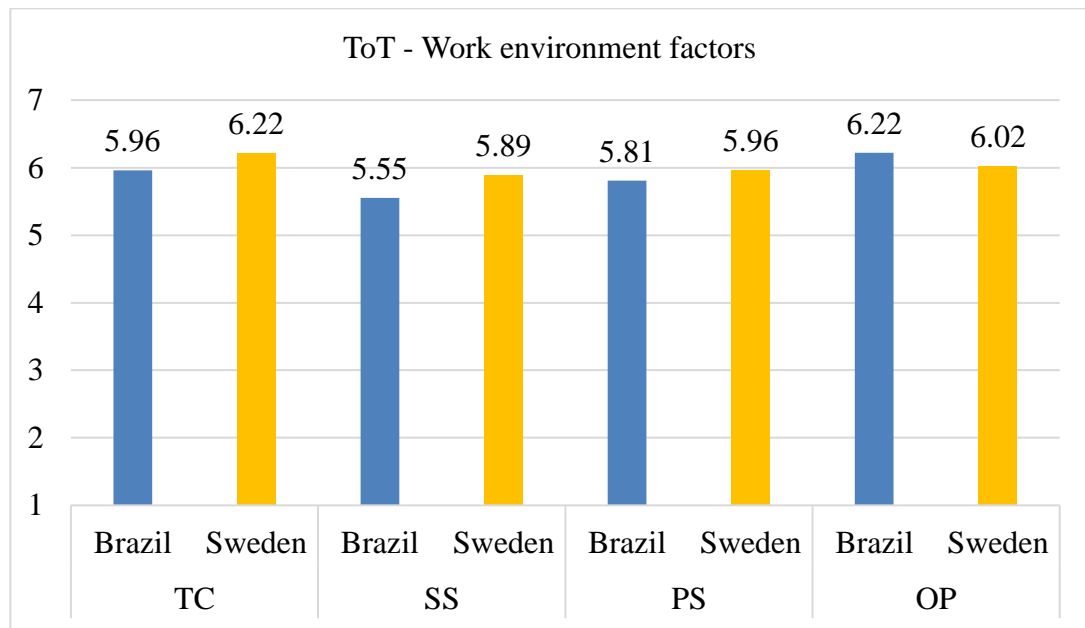


Figure 3: Work environment results – means of responses

Descriptive statistics group results:

Nation	TC			SS		PS		OP	
	N	M	SD	M	SD	M	SD	M	SD
Brazil	154	5.96	1.154	5.55	1.447	5.81	1.241	6.22	0.945
Sweden	45	6.22	1.042	5.89	1.265	5.96	1.107	6.02	0.892

Table 7: Work environment. Descriptive statistics group results.

In order to determine the significance of the results presented, the independent samples t-test was performed and presented in Table 8.

Variables	Mean Difference	Lower	Upper	P
TC	-.261	-.639	.116	.174
SS	-.343	-.814	-.127	-.152
PS	-.144	-.549	.261	.485
OP	.199	-.113	.510	.211

Table 8 - Work environment. Independent Samples t-test.

Based on the quantitative results collected on work environment context, no significant differences were observed among the pilots surveyed.

Tables 9 e 10 presents the general perception of both groups, regarding flight simulator training and its effectiveness in transferring skills to the real aircraft.

Nation	ToT-GP		
	N	M	SD
Brazil	154	5.44	1.149
Sweden	45	5.82	.960

Table 9: Transfer of training – general perception. Descriptive statistics group results.

Variables	Mean Difference	Lower	Upper	P
ToT	-.381	-.751	.010	.044*

Table 10 - Transfer of training – general perception. Independent Samples t-test.

Results showed that there was a statistically significant difference ($P = .044$) in the overall perceived effectiveness of transferring skills practiced in the simulator to the real aircraft.

5.2 Open text data

5.2.1 Power Distance (PDI)

The higher scoring respondents commented that they were "a little afraid to ask questions, precisely because they are being evaluated on the missions evaluated in the flight simulator", as well as "the excessive approach and questioning by the evaluated pilot can be interpreted as a lack of preparation for the mission" and the existence of "a natural distance between the basic pilot and the instructor". Respondents with lower scores in this factor commented that "there is no real hierarchy, and the training is not designed as an exam. We ask the instructor questions and repeat parts if necessary". Thus, open text data indicate that there is a relevance in the perception of the PDI and its effect on the pilots' training.

5.2.2 Individualism (IDV)

Respondents had comments regarding the IDV "what is foreseen in the general program is fulfilled, if necessary, individualized training is possible", "individual difficulties are trained by the individual and not by the institution" and "there is no individualization of training". Thus,

the data collected through open text revealed the different perceptions of this factor among the pilots surveyed. This difference highlighted the demand for a higher level of individualized treatment among fighter pilots.

5.2.3 Masculinity (MAS)

Open text data reinforced the difference between countries, with pilots with lower rates stating that: "Everybody wants to succeed, but it's for personal pride. There is no competition because no one gets grades or anything". In contrast to these statements, respondents with higher index scores commented that "there should be competition and a sense of accomplishment to always be better than the last flight", "competition is minimized in flight simulator activities, but the competitive factor is more present in real flights", and "the institution encourages this competitive behavior in the Fighter Aviation Units".

5.2.4 Uncertainty Avoidance (UAI)

For respondents with lower index scores, the interpretation is that they believe there should be no more rules than necessary, and if they are ambiguous or do not work, they should be dropped or changed. Open text data reinforces the quantitative results, as respondents noted that "simulator training that goes beyond the normal scope of procedures is more fun/preferred", while the higher index respondents commented that "predictability is a factor sought by the student, ignoring the misunderstanding of the importance of proximity to real flight, where situations are practically unpredictable", "it depends on the administrative and operational activities of the day. The priority is to fulfill the basic (mandatory) program," but they present the counterpoint that "there is a range of scenarios proposed for training. From missions focused on specific training, in this case predictable, to emergency training missions, which are unpredictable.

5.2.5 Indulgence versus Restraint (IVR)

Consistent with the quantitative results, the respondents who scored higher on the index commented that "I train profiles that I do not like as well", "I like to train profiles that I feel comfortable with, but mainly I use the simulator to practice non-routine but critical situations", and "I train profiles that I consider more difficult, not necessarily those that I like". Thus, the pilot audience reinforces the quantitative data that enjoyment is high and that this is a relevant factor to be considered in flight simulator training.

5.2.6 ToT – Intervention design

Respondents registered in the open text fields that "The final result of the simulator is always made very clear to the student", "Most missions can be trained in the simulator beforehand. This makes it much easier to succeed in the flight", "The simulator meets the needs of basic flight and adaptation to the aircraft. It serves that purpose very well. It is not sufficient for combat training". Thus, the overall design is considered adequate, but, as in the case of the Swedish pilots, the flight simulator is perceived as adequate for training basic profiles but limited for profiles that require more complexity. Regarding mission feedback, the limitation of some simulator models that "it is not possible to do a video review of an attack mission" was noted, justified by technical limitations, but compensated by instructors who "provide feedback during the operational training phase flights". Thus, feedback was perceived as a mandatory factor in evaluated training missions, however rarely present in operational pilot missions, depending on pilot's self-assessment.

Regarding contribution of flight simulator activities to behavioral modeling, the pilots noted in their comments that "The simulator is an excellent tool to massify some procedures without having to use the aircraft itself", "Although the operation of the aircraft is identical to the aircraft, the difference in behavior of the simulator in relation to the aircraft, as well as the limited field of view, prevent training", "Because of the limitations of flight simulator piloting, I believe that this contribution occurs well at the beginning of the operational life. After this phase, the gain is drastically reduced" and "It is only not at the highest level due to equipment limitations". Thus, there is a perception of great benefit in using simulators for training, as basic flights are considered to be fully covered by flight simulators, but more complex missions are limited due to the technical limitations of the equipment itself.

In relation to the use of error-based situations to emphasize and motivate learning the correct procedures to be used in the real aircraft, respondents reported that "the Flight Safety Program helps a lot in developing the pilot's decision making process and in training for such situations", "there have been several trainings in this sense, but I think there is still a lot of room for improvement", "this happens mainly in training for abnormal or emergency situations" and "There are emergency training profiles that are shaped in this way, but I don't see that this is the case for other types of training". Thus, the error is perceived as used and useful for learning, but focused on emergency situations, with its use limited to these abnormal flight conditions and not to all aspects of training. This leaves a gap in the ability to use error presentation as a pedagogic approach to improve fighter pilots training.

5.2.7 ToT – Work environment

Regarding transfer climate, pilots made the following comments: "organizational culture is very favorable to the simulator, but often these activities are mandatory at certain times", "The squadron has the vision that simulator is extremely important for flight preparation and tries to develop its use every day", and "The use of the simulator is very encouraged by the unit". Thus, the perception of support from the organization is evident so that simulated training is effectively applied to real aircraft flights, thus the organizational climate is perceived as conducive to the transfer of knowledge and skills to different operating environments. And this is a agreement point between the two groups studied.

In relation to the support received from supervisory level (more experienced pilots), respondents noted that "The support of more experienced pilots and instructors is effective only during the pilot basic training in the aircraft" and "There is support from supervisors in certain evaluated missions. In other training sessions, it is common to do it alone". So, in general, positive support from supervisors is perceived, but with particular emphasis on the more basic missions. For more advanced missions, this support is less perceived, being a common perception between both groups.

Regarding peer support, respondents reported that "there is always a great exchange of experiences among pilots, almost always through the simulator", "the administrative requirements today take most of the pilots' time, the simulator training is done as an opportunity and to meet the minimum requirements", and "it is not something planned, but it is usually done". In this way, peer support was perceived by both groups as filling in some of the gaps left by the institution.

In relation to the opportunity to transfer training from the simulator to the real aircraft, the Swedish respondents registered, "I usually do the same profile in the simulator that I will do later in the aircraft, especially in the basic missions". The Brazilian respondents stated that "It is possible to adapt the simulator mission to the type of mission to be performed in flight and to perform the necessary training", "I believe so, but it depends on the individual will of each pilot" and "Usually yes, but there are exceptions for more complex profiles that cannot be replicated in the flight simulator".

The comments recorded by both groups highlighted the difference found in the quantitative data (Survey question 15 - Table 10) regarding the overall perception of the effectiveness of flight simulator training for activities in real aircraft. Respondents registered that "not all missions can be performed in the flight simulator", "some limitations of the current simulator

do not allow some missions" and "basic or intermediate mission profiles have a good training transfer. For more complex missions, the transfer is already low". As a result, the technical factor was perceived as a limiting factor in the overall ability to train all missions in the flight simulator.

6. Discussion

The results indicate that the pilots surveyed perceive differences in the cultural dimensions and effectiveness of pilot training transfer. The quantitative data highlighted that there is a significant difference between the organizational cultures of the surveyed populations in the factors of individualism, masculinity, uncertainty avoidance, and indulgence. Open text data supported the quantitative findings and provided important insights into the importance of power distance, intervention design and work environment in the pilot training program. Respondents' comments provided a deeper insight into the differences between the perceptions of the two groups studied.

6.1 Get closer to train better

Most of the respondents stated that they perceived a closeness, freedom and easy access between superiors and subordinates. However, there was a functional and administrative distance between the younger and more experienced pilots. This perception is translated into a reduced level of Power Distance according to Hofstede's scales, which contradicts the results of the author's research, in which the cultures of the two countries have a significant difference. Both populations perceived themselves to be training in a close environment, despite the previous findings and the fact that the national cultures were different.

A viable justification is the small size of the group of pilots and their close relationships, as well as the same level of training and skill requirements, although there is a hierarchical difference in rank (between lieutenant, captain, major and lieutenant colonel) and function (basic pilot, operational pilot and instructor) (G. Hofstede, 2010, pp. 76–9). The groups studied were made up of pilots in their squadrons who formed a small team, very cohesive and with close relationships, sometimes long-term. This relationship, based on a lower PDI, was more positive for the simulated training environment, as it provided the opportunity for less experienced pilots to engage in constructive collaboration with their supervisors, helping to ensure that important training information was communicated and understood efficiently.

Consistent with Pastor & White (2014), this reduction in perceived power distance between respondents is positive for the training environment, as junior pilots have the opportunity to ask questions to more experienced ones and better absorb the lessons learned in the flight simulator. Research results suggests that a relationship based on greater proximity between different performance levels is a positive environment for addressing the quality of training conducted.

6.2 Individual growth: the path to collective success

The perception of individualism showed a significant difference ($P = .012$) between the groups, in accordance with Hofstede's previous research. This was reinforced by the free-text data, in which the group with the lowest level of individualism emphasized the need for a higher level of individualized treatment in training activities.

As an argument to justify this result, I start from the premise that the workplace itself is a collectivist society, as described by Hofstede (2010, p. 135). The activity of flying is carried out in groups, by means of tactical squadron or hybrid formations; pilots operate in groups but have their flights in single cockpits, so their results are individualized. Consequently, it is an environment in which it is easy to find individual merits or failures. Therefore, they perceive the training as an opportunity to improve individual skills, even if they also improve for the benefit of the collective (squadron). In pilots' community, individualism turned out to be positive for training, because it created a sense of responsibility for one's own preparation and results (Inglehart, 2008), even though the environment is collective, these individual qualities are reinforced to achieve more consistent collective results.

As evidenced by Merrit & Helmreich (2000), in their study of 9,400 airline pilots, in which individualism was described as providing flexibility in decision making and allowing each team member to take individual responsibility for his or her own mistakes and opportunities. However, individualism also had some downsides in the form of difficulties in collaboration among team members, as well as possible trust issues among team members due to pilots' unwillingness to listen to and heed the opinions of others. Therefore, collective cooperation is fundamental in the activities of military pilots due to their characteristics of joint operations with complementary forces. In this way, individualism is positive for the training of individuals, but can be an obstacle if it is excessive and interferes with the cooperative relationships among group participants and among the different groups that make up the Armed Forces.

6.3 Cooperation as support for training

The quantitative data showed a significant difference ($P = .001$) between the masculinity indices of the groups studied, in line with Hofstede's results. Thus, one of the groups was identified as belonging to a more competitive, achievement and success oriented culture than the other. (G. Hofstede, 2010, p. 170). Open text data revealed that even in an environment with a greater culture of competition and search for results, pilots recognized that the flight simulator training environment allowed them to reduce these characteristics and, consequently, provide better learning opportunities. Thus, collaboration between individuals was perceived as more beneficial to learning the tasks of air operations than a more competitive environment.

A higher MAS index score can lead to faster results and more substantial short-term growth. In addition, this type of behavior can create a more effective and disciplined work environment and enhance individual performance. However, despite the potential benefits of rigid and competitive environment, Matos et al. (2018) argue that the potential harm from its abusive effects is broader and more significant. One of the negative effects is that by encouraging competitiveness and the use of abusive techniques, this type of behavior can create dissonance and dissatisfaction in the work environment, which can harm employee motivation and collective performance. Thus, a collaborative environment was identified as more positive for pilots' flight training by the groups interviewed.

6.4 Uncertainty as a factor in the training process

The difference between respondents' organizational cultures on Uncertainty Avoidance (UAI) was significant ($P < .001$), confirming the results of previous Hofstede research. Pilots positioned at a higher level of UAI recorded quantitative comments consistent with a strong need for rules and legal systems to structure training. The group positioned at a lower level of UAI believes that rules should be the minimum necessary and that relationships should be guided by principles and values (G. Hofstede, 2010, p. 208–13). Open text data revealed that the pilots' perception of the structuring of the training is generally positive. However, there are situations in which the presentation of unstructured profiles, without considering unexpected situations that occur in real flights, is also positive.

The responses analyzed indicate a significant impact on pilot's training, especially in the culture with high levels of uncertainty avoidance. Individuals in this profile of organizational culture tends to prefer rigid rules, such as discipline, specific processes, and procedures. In this context, training might provide clear guidance and specify the steps that training should take to achieve its goals. In the group with less rigidly uncertain organizational culture, training may

focus more on learning how to learn, with pilots having more freedom to figure out how to achieve their goals. Thus, structuring was interpreted as positive for training, but there must be openness for creativity and innovation, since the threats and scenarios faced by the pilots are not static and require a certain degree of cognitive freedom and flexibility (Finkel, 2011, p. 100–1).

6.5 Indulgence and how it affects training

The quantitative results showed a significant difference ($P = .001$) between the groups of pilots, consistent with Hofstede's findings. The interpretation is that both genders responded that they took the opportunity to fly missions they enjoyed, with pilots with higher scores showing a higher level of agreement. People in societies with high Indulgence scores generally show a willingness to fulfill their impulses and desires to enjoy life, have fun, and be optimistic. (G. Hofstede, 2010, pp. 294–5). Open text data presented those pilots preferred training that was more fun and less restrictive. These statements support the idea that training should provide engagement for the trainees so that there is adherence to the training program, thereby reducing resistance to the changes presented (Carretta & Dunlap, 1998).

By tradition and daily practice, military organizations have a more restrictive structure, with clear rules and regulations, and behaviors and training based on hierarchy and discipline. Thus, it is a low IVR cultural environment. However, the pilots reported a higher level of forbearance, moving away from the restrictive logic. This is interpreted as an environment conducive to the development of a shared vision, stimulating team-building integration and cooperation among people. In addition, the presence of an indulgent culture can allow for new learning opportunities and stimulate open and honest discussions among team members. Thus, a higher level of indulgence was perceived as positive by respondents.

7. CONCLUSION

The results of this research pointed out the important factors to answer the question proposed for the development of this thesis: **Do Swedish and Brazilian fighter pilots have different perceptions of flight training activities?** A quantitative method analysis was used to answer this question. The quantitative data showed a significant difference between the interviewed groups in the indexes of individualism, masculinity, uncertainty avoidance, and indulgence, allowing the analysis of these factors. The quantitative data provided substantive arguments for all five indices studied and were even relevant for the analysis of the two indexes that did not reach statistical significance, Power Distance and Individualism. Thus, the research was able to explore all the indexes of Hofstede's cultural domains, presenting an analytical approach to the training design and work environment in which fighter pilots training can best be developed.

In addition to responding directly to the proposed topic, this research provided access to relevant information on pilot training from different national and organizational cultures, but with important similarities in the approach and structure of the training program. Although the results are representative of the research population, they cannot be considered generalizable to other contexts due to the limitations population scope. However, the responses and comments collected may be considered relevant to the Air Force administration as a means of improving fighter pilot training, particularly in the use of flight simulators.

7.1 Future research

The results of this study warrant further research on the impact of multicultural environments on Air Force pilot training. The scope can be expanded to include other aviation activities beyond fighter units, including pilots of transport aircraft, helicopters, and drones. The scope was also limited to flight simulators, but it is possible to explore training programs that combine simulated activities with flights in real aircraft. Another point to consider is understanding how technology can be used to enhance the training experience. It is also important to understand how the Air Force training process works, taking a micro and macro approach to determine how internal and external factors contribute to the training process. By doing so, the cultural approach to training pilots can be further explored and contribute to the improvement of future training programs.

ANNEX 1

ACADEMIC RESEARCH – FLIGHT TRAINING

This study aims to investigate the factors that contribute to maximize the benefits of flight simulator training, at military activity.

The questions in this form are of an investigative nature, that is, it is not possible to answer, "right or wrong", but with levels of agreement, following the 7-point Likert Scale.

The answers cannot and will not be linked in any way to a single individual but are part of a larger population of pilots.

Estimated time required: 5-10 minutes

-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x

Operational experience:

- Basic pilot
- Operational pilot
- Instructor

Aircraft that is currently operating:

- A-29
- F-5M
- JAS-39

Flight Unit:

- Brazilian Air Force
- Swedish Air Force

1) In flight simulator training activities, I consider that there is proximity, freedom and easy access between superiors and subordinates.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
- Disagree Strongly disagree

Comments on question 1: _____

2) In flight simulator training activities, I consider that there is an individualized treatment with me and my operational needs.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
- Disagree Strongly disagree

Comments on question 2: _____

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3) In flight simulator training activities, I consider that there is a search for successful results, being the behavior driven by feelings of competition and achievement.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 3: _____

4) In flight simulator training activities, I prefer missions that have a high degree of predictability, being supported by legislation and institutional rules:

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 4: _____

5) In flight simulator training activities, I like to take advantage of the moment and the opportunity to train different profiles, which please me:

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 5: _____

6) When performing activities in a flight simulator, the objectives of the activity are explicitly communicated, and the desired performance is clear.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 6: _____

7) When performing activities in a flight simulator, I consider that the content presented, and the missions performed are relevant to the flight in the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 7: _____

8) After performing activities in a flight simulator, feedback is offered on the practice performed.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 8: _____

9) I consider that the activities in flight simulator contribute to the modeling of my behavior, making me more prepared for the flights in the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 9: _____

10) When performing activities in a flight simulator, error-based situations are presented, with the aim of reinforcing the correct procedures applicable to the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 10: _____

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11) When performing activities in a flight simulator, I realize that the organization is in favor of transferring the training to the actual aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 11: _____

12) When performing activities in a flight simulator, there is support from supervisors (more experienced pilots), so that the knowledge is transferred to the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 12: _____

13) When performing activities in a flight simulator, there is support from my peers (pilots with a similar level of experience), so that the knowledge is transferred to the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 13: _____

14) After performing activities in flight simulator, I have the opportunity to transfer the knowledge to the real aircraft.

- Strongly agree Agree Somewhat agree Neutral Somewhat disagree
 Disagree Strongly disagree

Comments on question 14: _____

15) I consider that the transfer of the training carried out in the flight simulator to the missions in the real aircraft is:

- Poor 1 2 3 4 5 6 7 Excellent

Comments on question 15: _____

Thanks for your contribution!

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