

Mind maps: study and memorization technique for the flight in the 2nd Air Instruction Squadron

Mapas mentales: técnica de memorización y estudio para el vuelo en el 2º Escuadrón de Instrucción Aérea

Mapas mentais: técnica de memorização e estudo para o voo no 2º Esquadrão de Instrução Aérea

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ABSTRACT

The military piloting course, taught in the 2nd year of the Air Force Academy (AFA), can be considered a course with a very high level of requirement related to theoretical preparation, and in this case, the use of various research methods is feasible. The purpose of this paper is to present the mental maps to aviator cadets, describing through them a few passages from the flight manuals and to encourage their use within the Cadet Corps. It is believed that this technique serves the type of study that the flight calls, with much information being memorized, in order, there could be fewer students' dismissals in flight at AFA. To achieve the goals, literature searches and surveys about mental maps were conducted among the cadets. The results turned out to be positive for the application and use of mind maps in the study activities for air instruction.

Keywords: Mind maps. 2nd Air Instruction Squadron. Air instruction. Military aviation.

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RESUMEN

El curso de piloto militar, dictado en el 2º año de la Academia de la Fuerza Aérea (AFA), puede ser considerado un curso de elevadísimo de exigencia relacionada a la preparación teórica y, en este caso, se vuelve factible el uso de métodos de estudios variados. La propuesta de este trabajo es presentar a los cadetes aviadores los mapas mentales, describiendo por medio de ellos algunos pasajes de los manuales de vuelo y estimulando su uso en el ámbito del Cuerpo de Cadetes. Se acredita que la técnica cumple con el tipo de estudio que el vuelo solicita, con mucha información a ser memorizada y, siendo así, se podría tener en la AFA un número menor de desconexiones en vuelo. Para alcanzar los objetivos se realizaron búsquedas bibliográficas y encuestas con los cadetes acerca de los mapas mentales. Los resultados se mostraron positivos para la aplicación y uso de los mapas mentales en las actividades de estudio para la instrucción aérea.

Palabras clave: Mapas mentales. 2º Escuadrón de Instrucción Aérea. Instrucción aérea. Aviación militar.

RESUMO

O curso de pilotagem militar, ministrado no 2º ano da Academia da Força Aérea (AFA), pode ser considerado um curso com o nível elevadíssimo de exigência relacionada à preparação teórica e, nesse caso, torna-se viável o uso de métodos de estudos variados. A proposta deste trabalho é apresentar aos cadetes aviadores os mapas mentais, descrevendo por meio deles algumas passagens dos manuais de voo e estimulando seu uso no âmbito do Corpo de Cadetes. Acredita-se que a técnica atende ao tipo de estudo que o voo solicita, com muita informação a ser memorizada e, sendo assim, poderia-se ter na AFA um número menor de desligamentos em voo. Para atingir os objetivos foram realizadas pesquisas bibliográficas e pesquisa com os cadetes acerca dos mapas mentais. Os resultados mostraram-se positivos para a aplicação e uso dos mapas mentais nas atividades de estudo para a instrução aérea.

Palavras-chave: Mapas mentais. 2º Esquadrão de Instrução Aérea. Instrução aérea. Aviação militar.

1 INTRODUCTION

Being an aircraft pilot, whether it is a fighter jet, a cargo plane or a rotorcraft, represents the dream of flying of many children and teenagers. Motivated, perhaps, by the smoke squadron, with their air shows, or by the encouragement of having an aviator in the family, or just for the mission carried out, many set the goal of joining the Brazilian Air Force (FAB) to serve their motherland as military pilots.

The Air Force Academy (AFA) is a higher education institution of the FAB, which aims to train future leaders of the Air Force, teaching aviation, quartermaster and infantry courses. The AFA apprentice ranks as a Cadet and, upon pursuing a career, can reach the highest military rank: General.

The military piloting course for airmen cadets is divided into basic instructions, taught by the 2nd Air Force Instruction Squadron (2nd EIA, in the 2nd year of training with the T-25 Universal aircraft; and advanced instructions, taught by the 1st Air Force Instruction Squadron (1st EIA), in the 4th year, with the T-27 Tucano aircraft.

What many candidates are unaware of is that the training for military pilot is full of demands that could cause serious problems, whether they are technical, operational, psychomotor or psychological. The rate of those who do

not complete the piloting course by the 2nd EIA is around 30% of loss of human resources.

This huge number of people dismissed from the training process ends up impacting negatively on those who must go through flight instruction. So, they invest a lot of time in dedication to studying, in most cases, during their own holidays by the end of the 1st year. Generally, as a studying technique, they often make copies of manuals, summaries, drawings, diagrams and simulations, so that these materials serve as a studying tool for the most varied challenges in the preparation to and study of different disciplines. The question that arises is: are these study methods the most efficient?

2 THE 2ND AIR INSTRUCTION SQUADRON

2.1 The Study for the flight

It is necessary to understand that, as a risky profession, aviation requires a lot of dedication to studies. The term “risky profession”, in this context, refers to the risk of death, inherent in the air activity itself in certain situations – take-off and landing, for example, in which the accident rates are higher.

At such times, much is demanded of the pilot’s multi-tasking capabilities and the decision-making process can be compromised if the professional has had his concentration split between psychomotor tasks and normal procedures.

One of the facts that differentiates the civil piloting course of the military one is that in the civil environment if the student does not achieve the expected performance in an evaluation mission, he will face the hassle of paying for as many review classes as deemed necessary and of retaking them. In the military environment, because of flight time limitations available for the instruction, the cadet who does not reach the expected level in a number of missions can be dismissed from the Academy.

It can be said that flight studies involve 4 (four) spheres of activities: memorizing emergency procedures (“malfunctions”), memorizing normal procedures (“checks”), studying the Technical Instruction Manual of Aircraft T-25 (MAITE) and studying the Manual of Procedures (MAPRO).

Every aircraft has a checklist, a booklet in which all normal and corresponding emergency procedures are indicated. Emergency procedures (the so-called “malfunctions”), totaling 29 (twenty-nine), indicate the sequence of steps to be taken in case of any flight emergency, for example: engine failure in flight, fire on a wing, engine fire upon start-up, etc. These are actions that can save the pilot’s life in case of an unexpected event.

Memorizing and knowing how to repeat by heart all malfunctions is a part of the study of the flight, which is often chosen as a first step. The cadets usually do this in the second half of the 1st year, around August or September. To facilitate the process, the class prepares

“malfunction cards”, which are 29 (twenty-nine) plastic cards, each one with a printed malfunction. The advantage is to be able to carry them in one’s pocket, something that cannot be done with the checklist, and study them at any time when there is idle time.

There are also those who make print copies to memorize the normal procedures. Generally, the cadets read those repeatedly until they can repeat them without consultation.

2.2 Technical Instruction Manual (MAITE)

Over the last few months of the year, in September or October, the 1st year Cadet himself prepares a copy of the Technical Instruction Manual, because the instruction section only provides it in November.

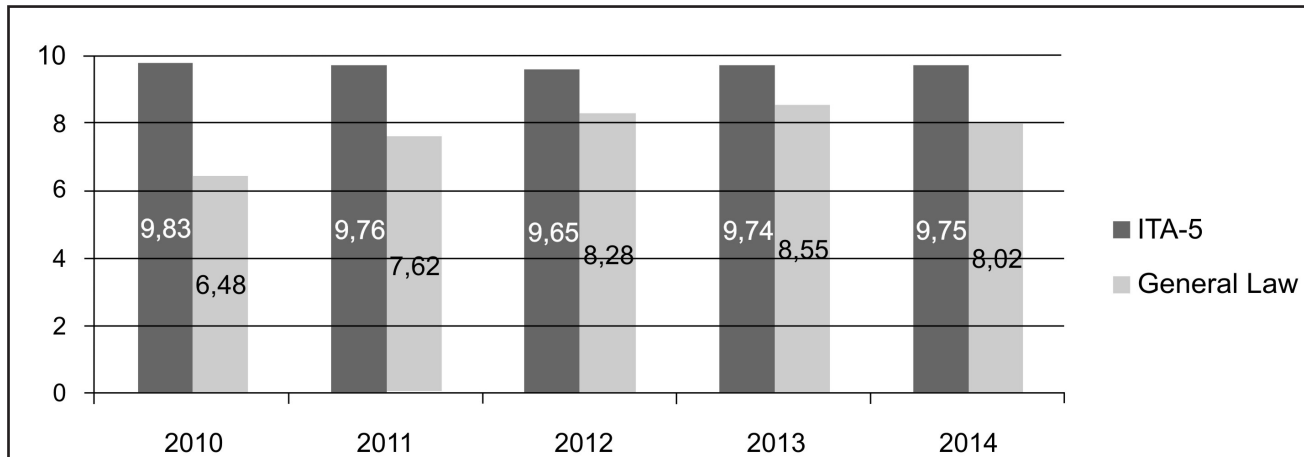
In the MAITE, there is information about the systems, operating limits and flight characteristics of the T-25 aircraft. It is the manual that allows knowing it thoroughly, as it is packed with information and numbers to be memorized.

The MAITE instruction is taught to aviation of the 1st squadron by 2nd EIA flight instructors in the discipline “T-25 Aircraft Technical Instruction” (ITA-5), delivered in November.

The Subject testing is carried out at the beginning of the following year, which allows the cadets to study during the holidays. The test consists of 50 (fifty) objective questions, in which few cadets miss more than two of them.

Graph 1 shows the averages of the divisions of the past 5 (five) years in ITA-5 and in General Law, a subject taught to the whole class during the 1st year, taken as an example for comparison of the subjects in relation to the discipline from the specific field of aviation.

Graph 1 - Overall averages in ITA-5 and General Law over the past five years.



Reference: The author.

2.3 Manual of Procedures (MAPRO)

All rules and standardizations concerning flight in sector E (East) of the Academy, where the 2nd EIA flight is held, are contained within the Manual of Procedures.

At the beginning of the 2nd year, the airmen receive the preparation of the Pre-Solo Phase, a lesson for the whole aviation, in which the rules contained in the MAPRO are exposed and the phase of the piloting exercises are standardized. The preparation is also evaluated by the “MAPRO test” held shortly after the ITA-5 evaluation.

To start the flight, the cadet must memorize well the normal procedures contained in the checklist (e.g.: engine start, internal inspection, take off, etc.), simulating their execution inside the plane. Repeatedly simulating the sequence of steps of flight procedures inside the aircraft, with the battery disconnected, is what is called “accomplishing nacelle hours.” By training in the nacelle, the fixation of information is improved and learning is more effective.

T-25 aircraft in the 2nd EIA's patio are made available for 1st-year cadet studies as of November. By the end of October, the roles of “nacelle leader” are assigned to 2nd-year aviator cadets who have completed the course and are tasked with practicing nacelle hours as well as answering questions of, generally, two to three led 1st-years. When the led apprentice learns to simulate the checks on the plane, it is common for them to go to the patio and train, alone or with colleagues, during hours of air exercise.

The Commander of the Air Force Cadet Corps (CCAer) authorizes that, once initiated the vacations, they remain at AFA for up to one week and return from them a week earlier to train in the nacelle. In order to practice during the holidays, some of them also move to other FAB units operating the T-25, such as the Air Force School of Experts (Guaratinguetá, SP, Brazil) and the Lagoa Santa Aeronautical Material Park (Lagoa Santa, MG, Brazil).

Another way to memorize the checks, widely used in the very dorms and during the holidays, is the so-called “photocelle,” a large printed photo (80 x 60cm or larger) of the aircraft's panel as a way to get used to the positions of the indicators and simulate procedures.

Besides nacelle leaders, the task of teaching the so-called “small classes” to the 1st Squadron aviation is also delegated to 2nd year veterans. These are informal presentations, prior to the ITA-5 instructions and generally address one MAITE chapter a day, in order to explain the manual and to clarify doubts.

2.4 Blindfolded checks and emergency tests (CHOVE)

Studying during the holidays is a relay among the MAITE, constant malfunction reviews, learning and fixation of checks, study of the MAPRO and accomplishment of nacelle hours.

Many of the cadets study at least a few hours a week during the holidays, dividing their time between family, leisure and flight studying. The main learning methods are copies, summaries, questionnaire resolutions and frequent reinterpretations of the manuals.

After returning from vacations in January, and taking the ITA-5 tests and preparations in February, the 2nd-year Cadet also goes through the Critical Emergencies Test and Blindfolded Check (CHOVE). The test consists of a small knowledge assessment of the most important malfunctions, while CHOVE is an activity in which the Cadet, blindfolded inside the plane, must indicate to a flight instructor the corresponding position of the items they ask. It is a way to assess a Cadet's familiarity with the nacelle.

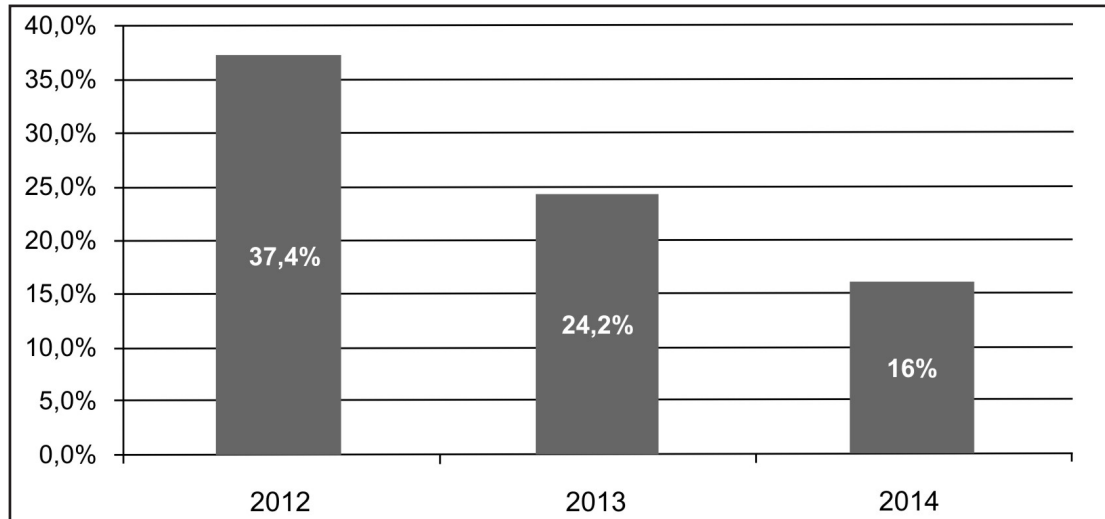
2.5 Assessments

Usually, the 2nd year piloting course (T-25 basic stage) does not last more than seven months. In 2013, it began in late February and ended in September, after the last Cadet completed the navigation phase. Each Cadet completes it with approximately 45 hours of flight.

In flying clubs, flight checks are performed after at least 17 hours of instruction, as provided by the Air Force Command Manual 58-3 (Private Airplane Piloting Course Manual). If an unfavorable outcome is obtained from checking, the student may pay as many review classes as deemed necessary and retake them when ready. I.e., the civil student can finish the pre-solo phase in 20 hours, which is the minimum required by the manual, or much more, depending on their performance.

Theoretical knowledge is highly demanded, especially in the first weeks of instruction. The Cadet who does not meet this criterion, visibly, stands out from the group before the evaluations, whether through questions asked by teachers before and after missions or through surprise tests applied, whose resolution usually have a limited time of 15 minutes.

The attrition rate in recent years, when compared with other military academies, is high. In Graph 2, one can see a comparison between attrition rates (percentage of candidates who have not completed the course) in the past three years in the 2nd EIA.

Graph 2 - Attrition rates in T-25's basic stage in the last 3 years.

Reference: The author.

The Operational Instruction and Maintenance Program (PIMO) establishes that, if the student obtains a degree of 2 (two) in one or more flight evaluation items (which are 45 [forty-five] in the Pre-Solo check, for example), a grade 2 (two) (poor) will be assigned to the mission.

If 4 (four) of these items are present in all course missions and relate only to the theoretical readiness (Theoretical knowledge, Awareness of emergency procedures, NPA Application and Inspections and Checks), it is important for the Cadet to promptly know the theoretical contents with regards to flight by the end of the course.

Besides, memorizing the performance of exercises conducted in the 4 (four) phases, with all their characteristics and peculiarities, requires much studying and many nacelle hours.

It is expected from the student, as they progress in the EIA and learn new exercises, to keep up with MAITE reviews and malfunctions, in order to stay updated on assessment items of theoretical knowledge.

It is clear, in this context, in the issue of learning and also in the Cadet's routine the great need of using an efficient method for the study of technical procedures in instructions, a factor that justified the survey to check the most efficient methods in aviator Cadets' learning.

3 EDUCATIONAL PROPOSALS

In the 1970s, the Englishman Tony Buzan developed in London a diagram called "mind map." According to its creator, the map encourages and assists the mind in the memorization and organization of information, based on visual stimuli and associations that mimics the structure of thought.

It is understood that mental maps can help with "a shorter path" for the attainment of proficiency in studies that the flight demands, since it stimulates memorization and allows for faster reviewing.

In addition, there are also possible applications of the maps in excerpts of flight manuals and stimulation, in general, of its use by future officers of the Brazilian Air Force.

The viability of the technique is based on the assumption that it meets the type of study that the 2nd EIA calls for, full of information to be memorized.

According to Buzan,

The nature of the Mind Maps is closely related to the functioning of the mind. Thus, they can be used in virtually all activities involving thought, memorization, planning or creativity. (BUZAN, 2010, p. 150, our translation).

That being, it is also believed that this tool can support individuals who believe they have difficulties to remember technical information. In his work, the author highlights the importance of reviewing, making clear the advantages of reviewing versus the disadvantages of not reviewing (BUZAN, 2010).

3.1 Mind maps

In the late 1960s and early 1970s, the American neurobiologist Roger Sperry began a series of studies about the brain. For his work on the "split-brain," Sperry received the Nobel Prize in Medicine in 1981, prompting a lot of research on the human mind's capacity, which reached its zenith in the 1990s, when the United States Senate declared them the "brain decade."

Although much still is unknown, there was, with the studies from that time to the present day, an approximation of the knowledge of the human brain

capacity. Recognizing the potential of the brain is the starting point to believe in the effectiveness of the mind maps. The authors Ontoria, Luque and Gómez (2006, p. 13) show some numbers and analogies about the brain:

- Number of neurons: 30 (thirty) or 100 (one hundred) billion larger than the number of stars in the Milky Way.
- Neuronal connections: every nerve cell has between 1,000 (one thousand) and 500,000 (five hundred thousand) connections. This means that the possible number of connections in the brain is astronomical: 25×10^{30} .
- The National Academy of Sciences makes the following estimate: one human brain has a larger number of possible connections between its nerve cells than the total number of atomic particles in the universe.
- The brain would be equivalent to a computer with 20 (twenty) million books of 500 (five hundred) pages each.
- If one received 10 (ten) units (word/image) per second for 10 (ten) years, one would not even have used 1/10 of brain storage capacity.

Such information, although not having direct relevance in the use of mind maps, according to the authors, represent the limitless potential of the human mind. Simply knowing that the brain itself is able to perform unimaginable tasks and to retain large amounts of information is something that can motivate students who believe they have difficulties in learning.

Studies by Sperry (1970) and his research team have shown that there is a laterality of brain functions. The right and left hemispheres of the brain are responsible for specific skills that determine the way of thinking, perception and personality of individuals. His research was the starting point that multiplied the studies in this area.

According to Buzan (2010), the left hemisphere is linked to the question regarding logic, words, lists, numbers, relationships, linearity, analysis and actions of the sort – activities considered academic. It determines an analytical and rational thought, guided by logic. People who use the left hemisphere predominantly tend to be rational, meticulous, perfectionist and need an organized working environment without elements leading to dispersion.

The right hemisphere is linked to the imagination, colors, rhythms, spatial awareness, visualization and creativity.

According to Ontoria, Gómez and Molina (1999 apud ONTORIA; LUQUE; GÓMEZ, 2006, p. 16-17) “it is more oriented to the whole than to the differentiation of the parts; and also to the integration and synthesis rather than to decomposition and analysis.”

The left hemisphere develops logical capacity, organization in decision-making and tends to be based more on real data than on intuition.

According to Ontoria, Luque and Gómez (2006), in the Western culture, education had been valuing the left hemisphere over the right one, that is, rational, analytical, sequential and linguistic thought.

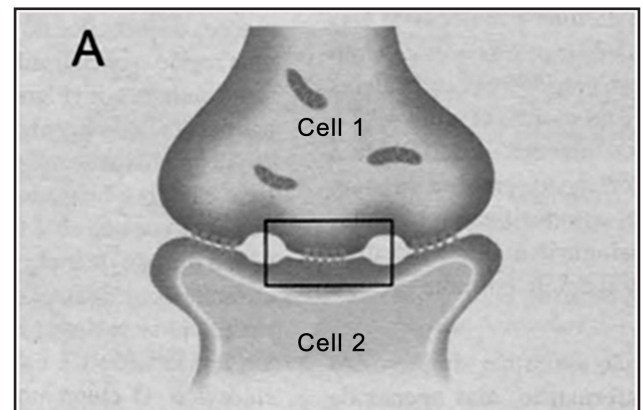
Currently, the abilities characteristic of the right hemisphere have been recognized by scholars and it is believed that, for learning to be complete, one must use the two halves together and there must be a complementation of brain functions to consolidate a more complete thought.

The basic unit of the nervous system is the neuron cell, comprised of a core and several dendrites (one of them longer, called an “axon”), which are extensions through which there are no connections with other neurons. The interaction process between them is called a “synapse” (Figure 1). According to Lent,

The synapse is the signal processing unit of the nervous system. It is the microscopic structure of contact between a neuron and another cell, through which the transmission of messages between the two happens. (LENT, 2001, p. 112, our translation).

According to Ontoria, Luque and Gómez (2006, p. 14), each nerve cell can perform over 10,000 (ten thousand) connections per second.

Figure 1 - Illustration of synaptic transmission between nerve cells.



Reference: Lent (2001, p. 115).

In learning, the brain acts from associations (ONTORIA; LUQUE; GÓMEZ, 2006, p. 23). When a unit of information (an image, an information, a food flavor, for example) reaches the brain, connections with other available data are immediately generated. “The number of synaptic connections linked to specific information determines the quality of its retention” (BUZAN, 2010, p. 34). This means that the more simultaneous connections exist, when an individual stores something in their mind, the more likely they will be able to remember it later.

The creation of associations with the available information is one of the perspectives from which

authors Ontoria, Luque and Gómez (2006) define the meaning of “radiant thinking.” The word “radiant” is herein interpreted from the analogy of the thought-associations structure with a lighted central sphere, whose light “shines” in different directions.

3.2 Mnemonics

Mnemonics¹, whether words, songs, images, drawings, phrases, etc., are artifacts used to recover information from the memory. It is a known technique, practiced and constantly used by students of secondary and higher education, including AFA Cadets, especially by aviators in flight phases.

Songs that recall mathematical formulas or sentences indicating the elements of the periodic table, for example, are powerful mnemonics used by school students. The famous scheme representing the months that have 31 (thirty-one) days in the bones of the hand also falls into this technique. Tony Buzan (2010, p. 74) says that it is a powerful means to stimulate the imagination and encourage the brain to make associations.

Using mnemonics is a habit that should be explored in the memorization process, especially by AFA aviator Cadets. Acronyms are often used in the study of flight manuals, which are words formed by the first letters or syllables of successive words in an utterance (e.g. UN, United Nations).

It is recommended that the development of these “memory stimulators” go beyond the construction of acronyms. One can create an infinite number of “key images” or songs, for example, as effective ways to recover information from the memory. Buzan (2010, p. 76) states that mnemonics that make appeal to more than one body sense are more powerful. For example, a memory that contains smell, texture and sound, is better assimilated than one that contains images only.

In this context, according to the same author, all that is represented through motion, sexuality, humor, numbers, symbolism and exaggeration, among others, will have more potential to fixate information in the memory (BUZAN, 2010, p. 76-80). Thus, developing mnemonics with these characteristics turns out to be a good strategy to memorize information.

3.3 Keywords

In study activities, it is important to develop the ability to summarize paragraphs and general ideas into keywords. Their use allows for spending less time in retention of information and more efficient reviews. According to

Buzan (2010, p. 116), there would be two types of keywords: memorization and creative ones.

Creative keywords are evocative. They tend to form different images in the mind, not leading to a specific way of thinking. A creative keyword is more “general” and can stimulate different interpretations in different people. Using the author’s example, “words like ‘distill’ and ‘bizarre’ are especially evocative but not necessarily bring a specific image to mind” (BUZAN, 2010, p. 116).

The memorization keywords, in turn, are those that force the mind to make the proper connections in the right direction. They carry within them a wide range of images, upon being redeemed, they bring the same images from the memory. They tend to be a significant noun or a verb, surrounded by adjectives or secondary key adverbs.

During the studies, one must be careful to always adopt efficient keywords, that is, memorization ones. Choosing of creative keywords can make room for misinterpretation, for two reasons, according to Buzan (2010, p. 116):

- The multi-orderly nature of words: a word needs to connect with others to generate ideas and may have more than one meaning when used in different contexts. For example, the words “candy” and “bullet” in the phrases: “the child had strawberry candy” and “the autopsy found a bullet in the heart.” (in Portuguese “candy” and “bullet” are homonyms).
- Differences between experiences and personality traits of people: the same word may generate different connections in the mind of different individuals, insofar as they differ in their world experience and personality. The word “needle” for example, can awaken bad memories in a child, like the pain they felt upon being vaccinated. To a seamstress, however, it will likely bring images of her work routine, and may make her remember a job she must complete.

Still according to Buzan,

The main part of memorization is in the key concept’s nature. It is not, as commonly believed, a word-by-word verbal process. (BUZAN, 2010, p. 118, our translation).

Due to speech and writing, the manner the speaker adopts to convey the images he has in mind, today there is the mistaken belief that the best way to remember images and ideas is through sentences. Thus, students in schools spend too much time making long notes of the lessons that, in practice, according to the experience of Buzan himself, are inefficient. The author argues that 90% of the words used in traditional school notes are not necessary for memorization (BUZAN, 2010, p. 120).

¹ Etymological origin: from the Greek *mneme*, meaning “memory,” and *mnemon*, which means “conscious, aware.” It is worth mentioning that Mnemosyne was the Greek goddess of memory.

Moreover, the traditional notes provide more time consuming revisions. Time is wasted by reading words that have no effect on the memory and by the act of seeking memorization key words in the text that normally do not stand out from the others because of the absence of markings. The correct procedure would to summarize information in strategic keywords. The habit of correctly choosing them is a process that takes practice.

3.4 Mind maps: their construction

Tony Buzan, born in England in 1942 and graduated in Psychology, English, Mathematics and Science, is considered the father of mind maps for presenting them in his book Use Your Head, published in 1974 in London.

Since his university days, he showed great uneasiness about the functioning of the mind, especially during learning. Faced with the constant College tests, in a context where the habit of studying was based on notes, Buzan realized that the combination of various skills (use of colors and words, for example) allowed the brain to work more effectively. Experiments with himself and others allowed the development of the technique (ONTORIA; LUQUE; GÓMEZ, 2006, p. 38).

In the words of Buzan (2010, p. 123), a mind map “is a thinking tool graphically and visually

interconnected for memorizing, prioritizing and generating information.”

It is a diagram that is a central idea from which branches stem from, representing related information, using color, keywords, key images, rhythm, logic and other memory stimulators.

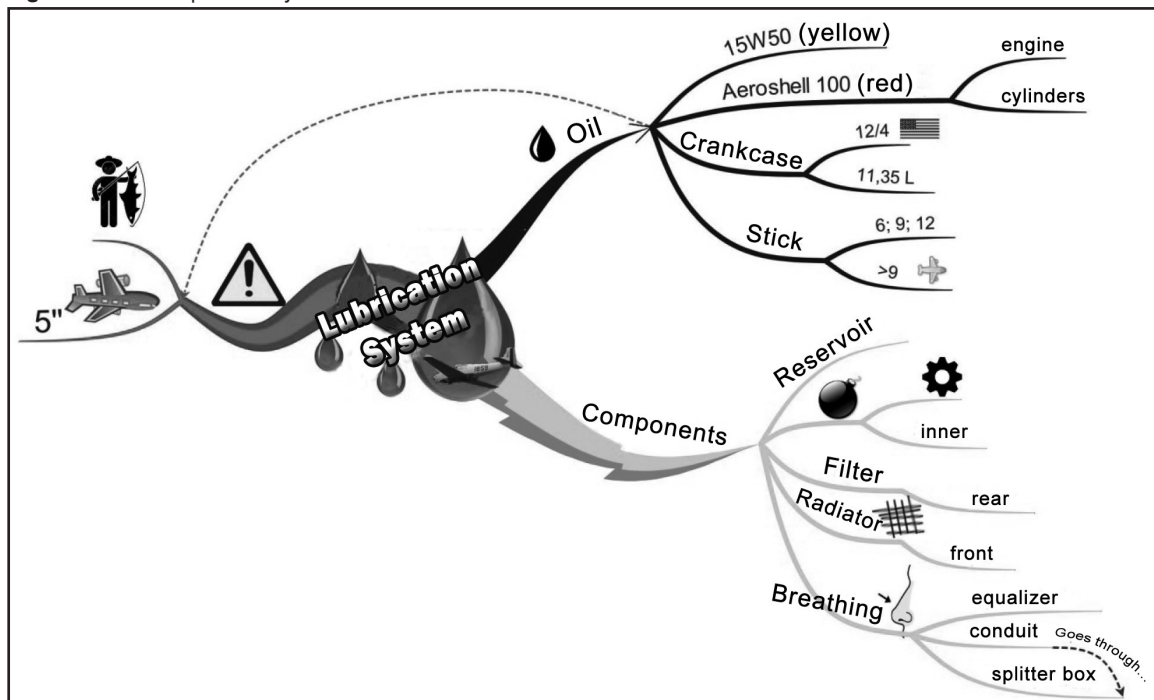
The conceptual significance that authors Ontoria, Luque and Gómez make of the technique is as follows:

Mind maps are a way to represent the ideas that better relate to symbols than complicated words: the mind immediately makes associations and represents them quickly with the map. Usually, mind maps are prized as a revolutionary system of organization of ideas, as they are graphical features that integrate the use of the brain hemispheres, making it possible for the individual a greater understanding capacity. In this sense, mind maps become a powerful graphical technique that facilitates the use of brain potential. (ONTORIA; LUQUE; GÓMEZ, 2006, p. 43, our translation).

The effectiveness attributed to mind maps is related to three characteristics: their shape, which is a direct manifestation of the concept of radiating thought; the integrated use of two hemispheres, due to the presence of color images; and the use of mnemonics and keywords.

Figure 2 is a simple example of a mind map that represents the key concepts of a 7 (seven)-page booklet of the subject “Aerodynamics”. It was made by a 3rd-year aviator Cadet at AFA.

Figure 2 - Mind Map – Aerodynamics.



Reference: The author.

The presence of colors and images is noted in the example (Figure 2), which stimulates the activity of the right cerebral hemisphere and, therefore, the use of the brain in its entirety. This feature confirms what the pedagogy and neuroscience scholars say about the workings of memory:

in order the memory works properly in the information process, it is necessary to seek the integration between the two hemispheres, balancing the use of our potentials. (SILVEIRA, 2004, our translation).

Yet another characteristic is:

[...] that the brain processes better, memorizes and recalls more easily information that combine words, numbers, orders and sequences with colors, images, dimensions, symbols and visual rhythm. (FERREIRA; CARVALHO, 2012, our translation).

Ideas are reproduced by keywords whose relevance has already been presented. According to Galante (2013), the process of preparing the maps is one of the best study methods, as it forces the student to use their synthesis capacity in essential ideas. They bind to each other through map branches: a representation that goes against the presented concept of “radiating thought”, because the lines induce the brain to make the required connections.

This is what is stated in the text:

The work with Mind Maps potentializes the higher mental functions, including memory, [...], because they are models that allow the layout of thinking in a nonlinear format, taking on the type of structure that the memory has. (FERREIRA; CARVALHO, 2012, our translation).

But although the mental maps have won thousands of users around the world and are praised by many scholars, in Brazil it is still a tool relatively unknown by students. In social networks, for example, mind-map based study webpages have few users. On blogs and on Internet videos in this regard, many reviews are from people who do not know the technique and ask for information on how to use it.

At AFA, this unfamiliarity is also common. In an exploratory survey of 1st-Squadron Cadets, 65% of

respondents said they had never heard of the technique and 15% said they had never used it, although they had already heard of it.

4 METHODOLOGY

4.1 Methodologies adopted

The methodological procedures adopted for the preparation of this article consisted of bibliographic research and field research, carried out with aviator Cadets. The description, results and discussions about it are exposed in the following items.

4.2 Field research

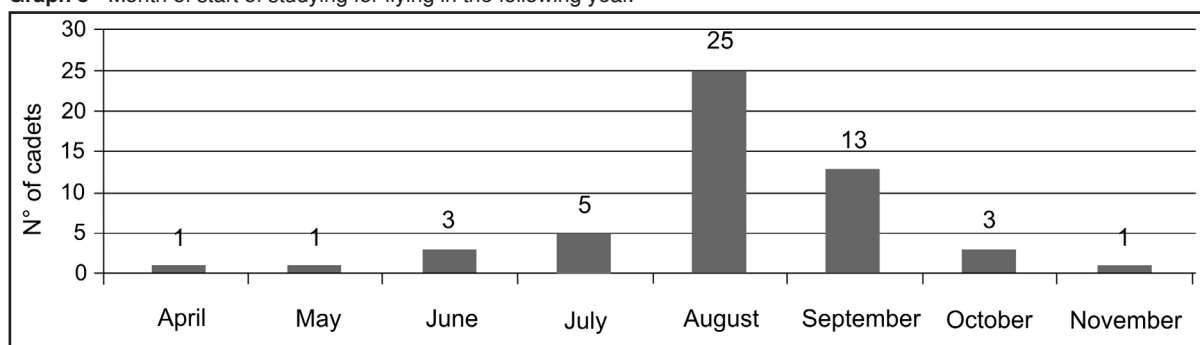
This research occurred with the application of a questionnaire of objective questions. The aim was to analyze, through the 4 (four) first questions, the cadets’ studying habits with respect to the flight to be held the following year, and through the last two (2) questions, to investigate the interviewee’s opinion about their capacity for memorization and their awareness of the mind maps technique.

On the first question, the respondents would have to indicate the month when they begin his studies for the EIA test. Among 54 (fifty-four) respondents, 2 (two) did not answer this question. Among those who answered it, 73% begin studying in August or September (Graph 3). Only 1 (one) Cadet (2%) intended to start in January, in the same year of his air activity.

On the next question, the second one, the Cadet was asked whether he intended to study for flight through the end of the holidays of that year. The responses of 52 (fifty-two) from 54 (fifty-four) respondents were positive and the 2 (two) remaining were negative.

On the third question, the respondents were asked to inform their intention to remain at AFA during the holiday period for nacelle hours, or to travel to Guaratinguetá or Lagoa Santa to the exercise. The results were the same as the previous question, with 52 (fifty-two) cadets answering “yes” and two answering “no.”

Graph 3 - Month of start of studying for flying in the following year.



Reference: The author.

It is noteworthy that Cadets realize, as airmen from older classes say, how the pressure in this regard in the 2nd EIA is very high, so their training as pilots depends on good preparation in this regard.

Aiming to analyze the respondents' studying habits, on the fourth question, it was asked about the studying habits for the MAITE subject. The highlighted indications were: frequent readings, summaries, copies, discussion/question sessions with colleagues, question-solving regarding it and others (Graph 4).

The MAITE was chosen as a benchmark because it is the most comprehensive manual and with the most information to be memorized and, therefore, the one that best fits in the use of mind maps.

The numbers are according to what is practiced year after year: in addition to the first reading and the obvious frequent re-readings, the vast majority of Cadets usually makes summaries, engage in conversations with colleagues and resolve questions to test their knowledge.

The option of making copies was marked by 32% of respondents. No Cadet marked the option "other", what leads us to the conclusion that there is no intention to use methods other than those indicated in the proposed alternatives.

On the next question, the fifth one, the goal was to determine whether there is a great amount of Cadets who find it difficult to store information. 10 (ten) respondents said they had difficulty or some difficulty to retain information, totaling 19% of the sample. Only 5 (five) (9%) deemed it easily. The remaining 39 (thirty-nine) Cadets (72%) marked the option "relative ease," interpreted as an intermediary performance between easily and hardly memorizing, with a slight tendency towards easily.

On the last question, the Cadets were asked to inform their awareness of mental maps, since the goal was to learn how widespread the technique is within the study group.

Most of the 35 (thirty-five) cadets reported having never heard of the mind maps. These, added to the 8 (eight) who claimed to know them despite not having practiced them, amount to 80% of respondents. Those who claimed to have used it totaled 11 (eleven) (20%).

Although a considerable amount of respondents claimed to know and have already used the mind maps, the fourth question indicated it is not within their intentions to use this technique in the study for flight, at least with regards to MAITE.

We are, therefore, faced with the feasibility of this work to present the technique to those who do not know it as a way to bolster those who do not consider themselves as good at memorizing, and suggest its use also in the aviation study for the 2nd EIA, since the importance of theoretical preparation is of utmost importance for Cadets.

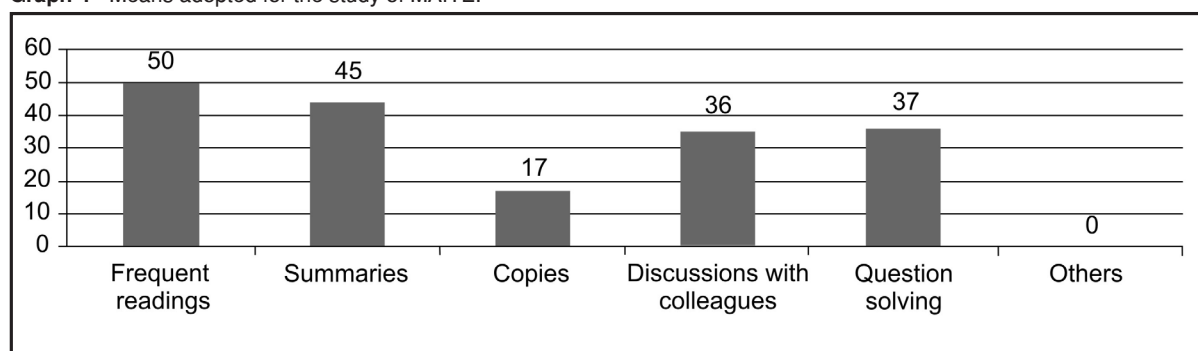
5 CLOSING REMARKS

Observing the AFA academic routine, it was noted that the transition between the 1st and 2nd year is characterized by a large mobilization of aviator Cadets with regards to the study for flight in the 2nd EIA.

The demand for lots of information to be memorized and the relatively high statistical dismissals cause the majority of Cadets to start the theoretical preparation well in advance and to remain studying, even during the end of the year holidays.

With the main purpose of proposing the use of mind maps to Cadets who are about to start the air instruction in the 2nd EIA, this discussion emerged from the hypothesis that the technique stimulates memorization, serving, therefore, the type of study that aviation requires, and that is not well known by the group of AFA Cadets.

Graph 4 - Means adopted for the study of MAITE.



Reference: The author.

Through exploratory research, it was observed that the number of people who have difficulty memorizing is not a majority, but it is also minimum the amount of those who claim to have broad ease at such activities.

Literature searches have found that, as recent studies claim the potential of the human brain as seemingly unlimited, we all have the capacity to develop the ability to memorize. Therefore, it is concluded that if there is no differentiation between brain potentials of different individuals, the use of the proposed technique, which stimulates the holistic use of the mind, it is a reasonable solution for those who claim having trouble with memorization.

The questionnaire allowed us to observe that, in a sample of 54 (fifty-four) cadets, most had not even heard of mind maps, supporting the hypothesis that the technique is still unknown by many of the interviewees.

It was also found that the information, procedures and numbers to be memorized, because of MAITE, MAPRO and “checklist” learning, are met by applying the concepts of irradiating thought, mnemonics, keywords and the joint use of both hemispheres of the brain – expressed by the use of mind maps.

Thus, the aim of this study, in proposing the adoption of an efficient technique to a group of cadets that, before the anxiety and uncertainties relating to flight in the 2nd EIA, only have the option to devote themselves entirely to their studies, has been reached.

Moreover, the work of the surveyed authors allowed verifying that the use of mind maps allows for faster reviewing, which fits perfectly the demands of the 2nd EIA, namely, having a well-prepared student throughout the piloting course.

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